American Machinist

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"GENTLEMEN, the machine age increased employment, increased wages, made work easier, saved lives and limbs, and enabled the working man to live in such comfort and luxury as was unknown to any man on earth when some of us were born."

Franklyn Hobbs
Director of Research,
Central Trust Company of Illinois, Chicago

THE MACHINE AGE *and its* CONSEQUENCES

IN 1891, just about forty years ago now, I conceived the idea in a rather vague form that business men did not possess as much dependable information on general financial and commercial operations as they needed for the proper conduct of their respective businesses.

Acting upon what was little more than an impulse I began gathering and arranging statistical facts on business operations. As my home at that time was in a mining country, my first work was the collecting and correlating of figures on mine production and on the distribution and consumption of metals and minerals.

About seven years later, or just thirty-three years ago, it was authoritatively announced that the known coal deposits of the United States would be exhausted in thirty-three years, should the then rate of consumption continue. We have lived through that thirty-three years, and while we have multiplied our coal consumption several times, we now know that our coal deposits will last for hundreds of years, the latest finding from a dependable source fixing the known coal supply as sufficient for our needs for seven thousand years at the present rate of consumption.

My purpose in dragging you through forty years of my own experience is to show you that the commonest article of commerce is misinformation on fundamental things. The distribution and broadcasting of such misinformation caused a mild business recession in 1930 to develop into a serious and painful business depression. Had every man in America had the knowledge which was possessed by some thousands of real students of business conditions, the depression in which we now wallow need have been no more than a mild business recession such as we experienced in 1924 and 1927.

The fishwives' tales that were brought to my desk during 1930 by men who believed themselves to be well informed would disgust every man in this audience were they to be repeated at this time. It would serve no purpose to repeat any of this claptrap at this time, but it will illustrate my point if I tell you that hundreds of important failures or impending failures were reported when there was never even the remotest possibility that such failures would occur. Every man had

An address before the Machine Tool Distributors of Chicago, at the Union League Club, January 9, 1931.

FACTORY EMPLOYMENT

	Total Value of Products	Value Added by Manufacture	Value Added to Material by Each Worker	Number of Workers	Amount Paid Each Worker	Workers Received in Per Cent of Added Value	Workers Received in Per Cent of Total Value
	(000,000 omitted)						
1899	$11,407	$4,831	$1,025	4,713,000	$426	42	18
1904	14,794	6,294	1,151	5,468,000	477	41	18
1909	20,672	8,529	1,289	6,615,000	518	40	17
1914	23,975	9,708	1,408	6,895,000	590	42	17
1919	62,042	24,809	2,757	9,000,000	1,162	42	17
1921	43,619	18,327	2,639	6,944,000	1,181	45	19
1923	60,530	25,846	2,945	8,777,000	1,254	43	18
1925	62,668	26,771	3,194	8,382,000	1,280	40	17
1927	62,718	27,585	3,304	8,350,000	1,299	39	17
1929	68,453	31,096	3,637	8,550,000	1,318	36	16

	Population of United States July 1	Per Cent Employed in Factories	(a) Persons Gainfully Employed	Gainfully Employed Per Cent of Population
1899	74,799,000	6	(b) 29,073,000	39
1904	82,601,000	7	.....	..
1909	90,691,000	7	34,255,000	38
1914	97,928,000	7	37,782,000	39
1919	105,003,000	9	40,282,000	38
1921	108,197,000	6	40,819,000	38
1923	111,511,000	8	42,156,000	38
1925	114,826,000	7	43,844,000	38
1927	118,141,000	7	45,747,000	39
1929	121,455,000	7	.....	..

(a)—Findings of National Bureau of Economic Research.
(b)—U. S. Census 1900.

some inside information on a distressing condition which might set the country by the ears. There is no such thing as inside information except that actually possessed by insiders. The outsider who thinks he holds inside information should command just the same attention as the man who gives you the inside dope on the horse that will win or offers to sell you a system which will beat the faro bank.

Real information in regard to all operations of consequence is available to all of us. We can know what is going on in every line of business and financial activity. Some men of large affairs and many men of small affairs lack the time and facilities to dig up all of this information for themselves; thus a job is provided for your speaker and others, the job being to collect, correlate, and disseminate the real facts regarding fundamental business operations.

In the course of our work, we chanced to draw off comparative figures from the manufacturing census of 1899 and that of 1921. A cursory comparison of these figures produced a fact which gave me a real mental jolt. If this thing were a fact, then every manufacturers' association, many of the leading manufacturers, and every labor union in the manufacturing field were all barking up a tree where the coon was not.

And so, we began in real earnest to try to disprove the situation which was indicated by comparing the figures of these two manufacturing censuses. We did not disprove our early finding, and we did prove that finding to be an indisputable, unassailable, incontrovertable fact; that fact is the most important fact which the machine tool industry has ever had laid before it. I shall state the fact now, and permit you to disbelieve it, as you, of course, will. Everyone will disbelieve it until it is mathematically proved to each individual. And even then, they may behave like Voliva and, after making a trip around the world, come back and say "I have been around the world but I still believe it to be flat, not round."

The fact is this, *the introduction of automatic and labor-saving tools and appliances into the manufacturing industry has not reduced the amount of money paid to labor by that industry and has not been able to displace workers in certain industries as rapidly as avenues of employment have been opened up to them in other industries.* That, gentlemen, is a fact which industry and labor would do well to contemplate.

Had there been no time and labor-saving tools introduced into factories during these last forty years, there could have been no electrical appliances, no telephone, no automobile, no moving pictures, no radio, no airplane, and the lowly cigarette which you smoke today would be beyond the reach of a man of ordinary means.

Three Times Father's Income

The introduction of labor-saving tools has made it possible for the ordinary factory worker to live in an atmosphere of comfort which neither George Washington nor King George III ever enjoyed.

True it is that, during the last thirty years, time-saving methods and tools have driven two workers out of every three away from the bench and left the third man drawing just as much pay as the three men had drawn before the tools arrived. The two men were driven from that bench to other benches at an increased wage in every case. It is easy to prove that machinery has thrown thousands of men out of jobs, and it is just as easy to prove that machinery has driven everyone of these men into a new job at higher pay. Every man who works in a factory today earns three times the money his father earned for doing the same work at the beginning of the century.

When this twentieth century began thirty years ago, this country had a population of 76 million persons; 6 per cent of them were employed in factories. At the beginning of last year, this country had a population of over 121 millions, and more than 7 per cent of them were employed in factories. It is apparent that the demand for factory workers has increased faster than the population has increased. This increased employment for factory workers must have been directly due to the introduction of machinery in manufacturing enterprise because the gain in factory employment was not so great in any other country on which we have records. With the other countries, increased factory employment occurred in proportion to the introduction of improved machinery, thus we have mathematical proof that the introduction of machinery in manufacturing operations has not caused unemployment.

His Share of the Pie

The wage side of the question may be dismissed with the simple statement that the factory worker, when this century began, was earning $426 per year; the factory worker of 1929 was paid $1,318 for his efforts. Factory employment increased 16 per cent faster than population increased while factory wages increased more than 200 per cent. These facts answer all questions as to the effects of machinery on employment and on wages.

This brings us to the much discussed matter of whether the worker is getting his share of the pie. The figures already given prove the great gain in employment, and the greater gain in wages, but the worker has been told that, through vast combinations of capital and mass production, the owner is constantly demanding a larger share of the pie. The mathematical facts on this phase of the question are quite convincing. There has been some variation in the portion received by the worker, and naturally, a similar variation reversed has operated upon the owner. The average for a period of thirty years ought to be a fairly reliable basis on which to form a judgment. During that thirty years the workers' share of the value added to raw materials through hand and machine work has varied from 36 to 43 per cent. The average for the thirty years has been something over 40 per cent received by the workers and 60 per cent received by the owner. Whether this division is fair or not, it is just what it has been since consolidation of manufacturing enterprise and mass production with the aid of tools has been in vogue. I submit that an unjust practice is unlikely to continue in a country like ours for a period of thirty years. I believe it fair to assume that labor is entitled to 40 per cent of the value added to raw materials in the process of manufacturing which is just what it has been getting and just about what it is likely to get in the future.

[It is hoped that no reader will misinterpret the "60 per cent received by the owner." Every business charge except labor's 40 per cent must be covered by the 60 per cent.—EDITOR.]

There is another angle which is really the most important of all and this figure tells the whole story as affecting capital invested and the effect on labor. I refer to that portion of the actual selling price of the product which goes into the pay envelope of the factory worker. During these thirty years since 1900, the portion of the total value of factory output received by workers has varied from 16 per cent to 18 per cent. In 1899 and 1923, the worker received 18 per cent of the total value of manufacturing production. In 1929, the workers received only 16 per cent. In every other year, the worker's share has been 17 per cent, and the average for the thirty years has been 17 per cent.

The worker was receiving 17 per cent of the total value of the product of the factory thirty years ago, and he continues to receive 17 per cent as his share. He was receiving 40 per cent of the value added to raw materials through manufacturing processes, and he is still receiving it. There were 4,700 thousand of him at work in the mills thirty years ago and there were 8,500 thousand of him at work in the mills in 1929. Only 6 per cent of the population was required to man the factories thirty years ago, and it now requires 7 per cent of the population to do the work.

Going outside of manufacturing enterprise and taking in the whole picture of the country's workers, whether they wear the overalls of the laborer or the shiny office coat of the white collar, we find another fact regarding employment which brings further surprise. A generation ago, 38 per cent of the whole population was gainfully employed, and now more than 39 per cent of the whole population is gainfully employed. In order that we may be supplied with the goods and services which our present mode of living demands, it is necessary that a larger portion of our population work. In my study of this subject, I have concluded that shorter hours and longer vacations are responsible for the 3 per cent gain in the percentage of the population which must work for a living, and the 16 per cent gain in the percentage of our population which must man the factories. If we go any further in the shortening of hours, it will be necessary for an additional number of people to don the overalls or the office coat and go to work.

The Salvation of the Worker

A recent report of Commissioner Ethelbert Stewart of the Bureau of Labor Statistics, shows figures which disagree with those which I have just given you because Mr. Stewart has seen fit to take the period of eighty years from 1849 to 1929. I am uncertain as to just what his figures are intended to prove, but I am certain that they did not prove anything of great importance because they make a flying leap from 1849 to 1929 without reference to the intervening trends. I mention this report, as I believe it may prove that the introduction of labor-saving machinery was the salvation of the factory worker. If the condition shown by the Bureau of Labor report had not been altered by the introduction of machinery during the last thirty years, the factory worker may have found himself at this time in a sorry plight.

In concluding this statement, I want to impress upon you the importance of spreading these facts so that they will reach the eye of every manufacturer, every stockholder in a factory, and every factory worker in this country. When this has been done, most of the labor disputes in factories will settle themselves, and the labor demagog who rants about machinery causing unemployment will have to go and find a small hole, crawl into it, and pull the hole in after him.

Gentlemen, the machine age increased employment, increased wages, made work easier, saved lives and limbs, and enabled the working man to live in such comfort and luxury as was unknown to any man on earth when some of us were born.

Should you ever again invite me to address you, I hope I shall be able to send my robot to do the job for me.

Long and Short Addendum

How gears can be made stronger and less noisy without special tooling

IF IT WERE generally known that long and short addendum gears can be easily produced with standard cutters and assembled at standard center distances, it is very probable that they would be more widely used than at present. This article outlines the elementary principles involved in the production and application of long and short addendum gears.

In Fig. 1 is shown a standard 12-tooth pinion meshing with a rack. This pinion was cut by a 14½ deg. full depth involute hob. The pinion teeth are of course, seriously weakened by undercutting at the tooth flanks. Fig. 2 also shows a 12-tooth pinion meshing with a rack. This pinion was cut with the same hob as was used for the pinion in Fig. 1. Fig. 2, however, shows no interference or undercutting; the teeth of the rack are the same size and shape as before, but the teeth of the pinion are much larger and stronger. The pitch circle and pressure angle in Fig. 2 are also exactly the same as in Fig. 1.

For a number of years a certain gear manufacturer bought standard 20-deg. full-depth hobs for his standard equal-addendum gears, and bought special 20-deg. hobs —one for the gear and one for the pinion—for his long and short addendum gears. Finally it was accidentally discovered that the fundamental dimensions of all these hobs were exactly the same, and that the hobs could be used interchangeably to cut either long and short addendum gears or equal addendum gears.

To cut such long and short addendum gears, all that is necessary is to make the pinion blank any desired amount larger in diameter than standard and to make the gear the same amount smaller. The teeth of both gear and pinion are then cut to the standard depth—measured from the outside diameter of each blank. Fellows-type cutters, Maag-type cutters, and hobs can all be used to cut such long and short addendum gear teeth.

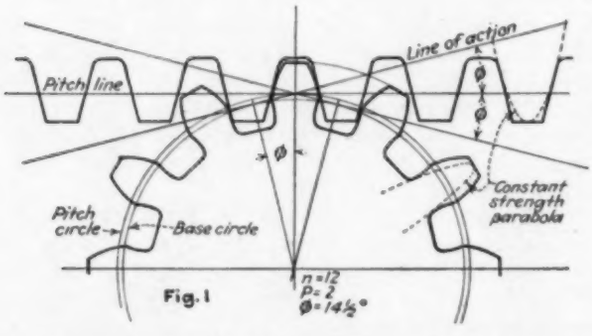

Fig. 1—Standard 14½-deg. pressure angle pinions, with small numbers of teeth, are weakened by undercutting

In general, any generating-type cutter will do, but formed rotary cutters will not, nor should the 14½-deg. composite-tooth standard hobs be used.

Three different tooth designs for the same gear application are shown in Figs. 3, 4 and 5. Fig. 3 shows standard 20-deg. full-depth involute teeth cut by a standard hob. Fig. 4 shows long and short addendum 20-deg. involute teeth cut by the same standard hob. Fig. 5 shows a little more extreme design of long and short addendum 20-deg. involute teeth also cut by the same hob. The center distance, pressure angle, and location

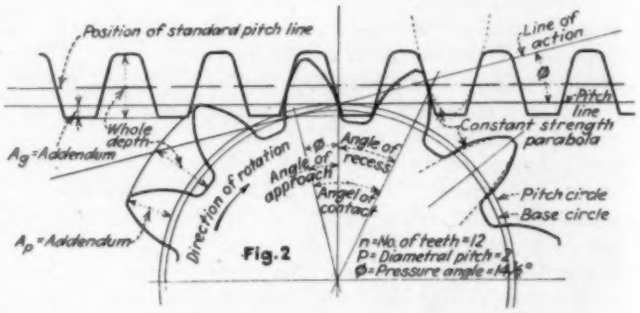

Fig. 2—Changing the addenda of the pinion and gear adds strength without altering the pressure angle

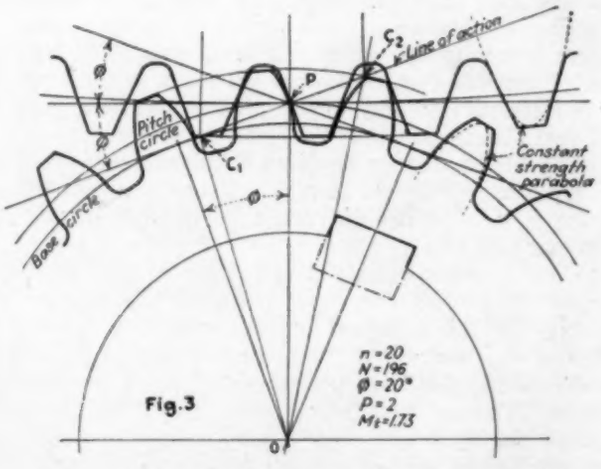

Fig. 3—A 20-tooth pinion and a 196-tooth gear with equal addenda

Gears

A. B. Cox
Consulting Engineer

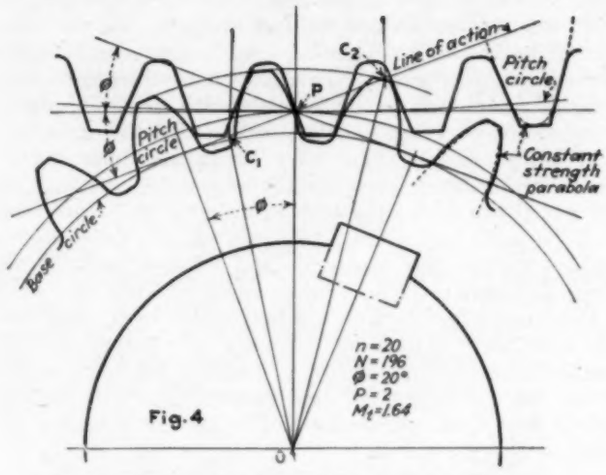

Fig. 4—The set shown in Fig. 3, cut with the same hob, but with long and short addenda

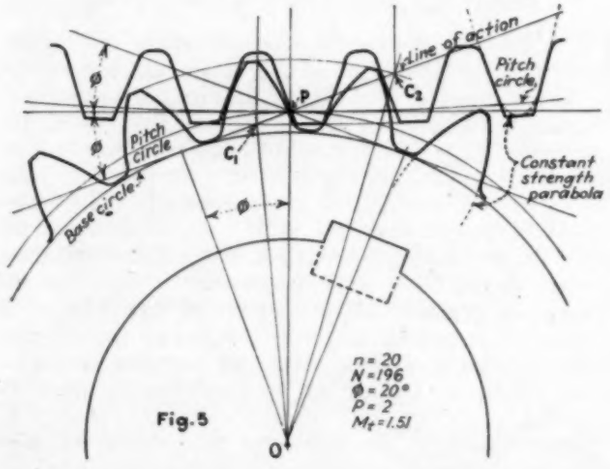

Fig. 5—A more extreme design of long and short addendum gears applied to the same set

of the pitch and base circles are exactly the same in all three designs.

A few standard objections are invariably made to the use of long and short addendum gears. First, it is claimed that the gears are special. But they are not special in the most important sense, namely that of requiring special cutters. The gears are special only in the sense that gear blanks of special diameter are required. Otherwise, they are special only in the same sense that all gears are special in that a certain size bore, keyway, hub length, and face width are required; replacement records must be kept in any case.

Another usual objection to the use of long and short addendum gears is that their performance is good only when the pinion is at all times the driver, and that the operation of the gears is very bad if the gear is the driver. This has been interpreted to mean that long and short addendum gears should not be used with motors where dynamic braking is used, because during the braking period the gear is driving the pinion. A detailed examination of this objection is worth while.

In Fig. 4 the length PC_2 of the line of action has been made equal to the length PC_1 in Fig. 3, so that if the gear is the driver in Fig. 4 the contact during approach will have to move no farther along the line of action than the contact moves in Fig. 3 when the pinion is the driver. In Fig. 5 the angle POC_2 has been made equal to the angle POC_1 in Fig. 3 so, if the gear is the driver in Fig. 5, the pinion approach angle will be about the same as the pinion approach angle in Fig. 3 when the pinion is the driver. For the exact definition and calculation of the angles of approach, recess, and contact, see *American Machinist*, page 559, Vol. 54.

The constant strength parabolas for one pinion tooth and one gear tooth have been drawn in each of the illustrations to show the relative strength of the teeth. It will be noted that one tooth could be dropped from the pinion in Fig. 5 and still leave as much depth of metal between the top of the keyway and the root of the teeth as there is in Fig. 3 with the full number of standard teeth. As this gear set was designed for an ore bridge trolley where weight and flywheel effect were objectionable, this reduction of $\frac{1}{2}$ in. in the pitch diameter of the pinion was important because it meant that a corresponding reduction of 5 in. in the pitch diameter of the gear could be made. Even with the full number of 196 teeth in the gear, the flywheel effect of the long and short addendum gear would have been slightly less than that of the standard equal-addendum gear. Regardless of whether the pinion or the gear is the driver, these advantages of stronger teeth, smaller gears, greater depth of metal between root of teeth and top of keyway, still remain, so that this second objection narrows down to a question of noise and wear.

There seems to be practically no literature on the subject of long and short addendum gear designs in which the gear drives the pinion. But an examination of such installations as there are in which the gear is sometimes the driver, and a frank questioning of gear authorities, will convince anyone that this supposed defect of long and short addendum gears has been misunderstood and greatly exaggerated. As will be seen from an examination of Figs. 3, 4, and 5, making the teeth of gears with long and short addendum slightly decreases the total contact and gets the contact farther away from the interference point of the pinion. This last point is important in making quiet gears, and it is most important in gears of large ratios, in which the other advantages of long and short addendum gears are also most effective.

Furthermore, since it is possible to increase greatly the strength and the wear resistance of a gear set, and to decrease its noise, by making the tooth contact closely equal to the integral number 2, old test data on the strength, wear, and noise of gears are very far from being reliable. Some theorists have attempted to show that because of the deflection of gear teeth under load, the compression of the metal of the teeth at their points of contact, and the compression of the oil film between the teeth, the tooth contact could not be calculated. The best and final answer to such theorists is that tests of

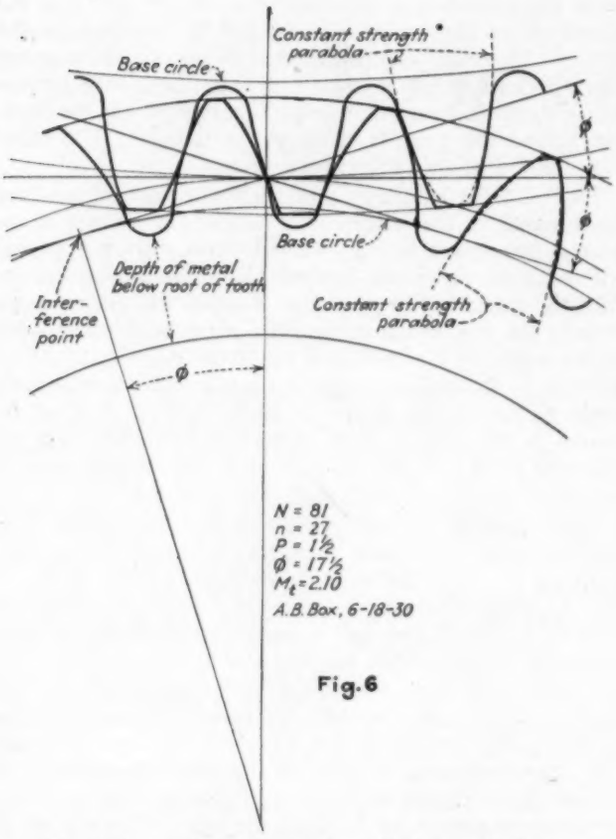

Fig. 6

Fig. 6—Integral contact gearing with long and short addenda for electric locomotive service

integral contact gears show them to be much stronger, longer lived, slightly more efficient, and consistently quieter than the old standard types of gears.

A rather extreme design of long and short addendum, integral-contact gearing for high-power, high-speed, electric locomotive service is shown in Fig. 6. This design was adopted by a committee of engineers in preference to any other tooth form, including a special stub tooth, primarily because of strength considerations. The user's standard construction for electric locomotive pinions was that of a ring pinion, spring connected to the shaft to reduce shock stresses. Since the user desired to retain this construction, the required depth of metal below the pinion tooth root necessitated an extreme long and short addendum design. Full theoretical contact of the teeth is seldom obtained in new gears. And when the gears are old and have worn in to full contact, the bearings have also worn and allowed the gear centers to separate slightly thus decreasing the contact. These gears were designed for 2.10 teeth in contact. The idea was that this value would probably give a tooth contact which would average nearest to 2.00 during the entire life of the gears. The constant strength parabolas of the gear and pinion teeth are very nearly the same. These gears have been entirely successful.

A single comparative test is sufficient to demonstrate the increased strength, decreased wear, and slightly better efficiency of integral-contact gears over the old standard designs. A noise comparison is much more difficult to make. This is partly because accuracy in cutting and aligning is the chief essential in any gearing and partly because gears designed to be even the exact opposite of integral-contact gearing, frequently operate satisfactorily in all of the fundamentals of gearing, such as strength, life, and quietness. This peculiarity is explained on page 848, Vol. 68, of *American Machinist*. Incidentally, this article shows a design of equal-addendum integral-contact gears that have already given more than three times the service ordinarily obtained from exactly similar non-integral contact gears in exactly similar service.

All gears are more or less subject to noise, as well as to wear and breakage, from mechanical resonance. The only reasons some of these gears are reasonably quiet is that they happen to operate too far from the resonant period to be much affected by it, or that the damping forces are great enough to keep this trouble down to a tolerable minimum. The noise in such gears is usually very sensitive to slight changes in speed, load, mounting, and other factors. Gears are sometimes quiet on the test floor and noisy after installation by the customer, all of which has added mystery to the gear noise problem.

Long and short addendum gears are not the complete answer to the gear problem. But when a gear set has been designed to have a combination of long and short addendum, integral-contact, a half-round tooth fillet, and involute teeth which approximate a constant-strength parabola in shape, the design is probably the best possible from the standpoint of the fundamentals of gearing, which are: economy, strength, life, efficiency, and quietness of operation.

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Bearings and Their Lubrication

IN A RECENT address under the above title before the Hartford Chapter of the American Society for Steel Treating, L. H. Nielson of the Technical Staff, Vacuum Oil Company, gave a thorough review of the principles and methods of lubrication. He stressed the importance of chamfering the oil grooves of a plain bearing in the direction of shaft rotation. Oil grooves should be placed about 30 to 45 deg. in front of the point of greatest pressure, and the number of these grooves should be as small as possible. Criss-cross and "fancy" oil grooves tend to lead the oil from the points at which it is needed, and they also reduce the effective area of bearing surface. As the pressure increases, more points of application of the lubricant must be provided.

Roller bearings are lubricated to protect the high polish and lubricate the rollers. Only enough lubricant is required to reach the level of one-half the height of the ball or roller at the bottom of the bearing. Tapered roller bearings act as centrifugal pumps. The large end should be placed on the inside to pump the oil away from the packing, and a groove should be provided to return the oil to the small end of the bearing. To minimize fluid friction, the oil used should possess the lightest body that will maintain, with safety, a complete film.

Discussion brought out several points. Gumming of oils is a result of the presence of animal oils or undissolved hydrocarbons oxidized by high temperatures or by churning. Watches and similar fine machinery require porpoise oil, costing about $75.00 a gallon, as it is the only lubricant which will give a satisfactory low pour test, absence from creep, and low oxidizing value. Air compressors require very little oil for the cylinder walls, and light vaporizing oils will make explosive mixtures with the compressed air.

NEW BOOKS

WERKSTOFF—HANDBUCH STAHL UND EISEN—*Edited by Dr. Karl Daeves from the published material of the German Iron Association. New edition including supplements, Series I and Series II. About 330 loose-leaf pages, 7x9 in. Imitation leather covers. Published by Verlag Stahleisen, Breite Stresse 27, Dusseldorf, Germany. Price 24 gold marks. Price of separate supplements, 3.50 gold marks.*

The previous edition of this book was reviewed in the March 28, 1929, number of *American Machinist*. Since then, supplements Series I and Series II have been issued. Its loose-leaf form makes it possible to keep this book up to date with the latest advances in basic data and information on the properties, processing, and testing of iron and steel.

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ROMANCE OF THE MACHINE—*By Michael Pupin. 111 pages, 4¼x7½ in. Clothboard covers. Published by Charles Scribner's Sons, 597 Fifth Ave., New York, N. Y. Price $1.00.*

Professor Pupin of Columbia University gives the key to this little volume in his opening paragraph, " 'Machine Civilization' is a favorite topic of several noted European writers. They have nothing good to say for it. Some of them write of it as an American plague. . . . Is their indictment supported by evidence from American history, or by evidence against American science and engineering, which they hold responsible for the evils of the so-called Machine Civilization?" He answers his own question in a sustained and sonorous negative. Those connected with machine civilization who feel called to defend it will here find defensive material.

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THE UNITED KINGDOM—AN INDUSTRIAL, COMMERCIAL, AND FINANCIAL HANDBOOK—*By Hugh Butler, American Trade Commissioner in London, and officials of the Departments of Commerce and State. 953 pages, 5¾x9 in. Illustrated. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C. Price $1.75.*

British commercial methods have long been an enigma to American industry, despite the employment of a common tongue by these two leading commonwealths of the industrial world. In the 38 chapters of this volume are given, in readable form, information and statistics on industry and commerce in the British Isles, information which has previously been unavailable to all but a privileged few. Conditions under which each commodity is produced are supplemented by data on a host of related subjects. The introduction explains Britain's pre-war and post-war conditions, and is followed chapters on production costs and prices, labor, wages, and living costs, and the industrial structure. Iron, steel, non-ferrous metals, industrial equipment, and automotive products are each the subject of a chapter. Oversea trade, finances, the British Market, and Northern Ireland are included in the volume, data which has long been partly, at least, obscured by normal prejudices, or was otherwise unobtainable. A knowledge of the facts is the best basis for an understanding of the tangibles and intangibles that comprise commercial activities and national life.

The text is accompanied by maps, charts, tables, and illustrations. A comprehensive bibliography and index complete the book, one of the most useful publications so far issued by the Bureau of Foreign and Domestic Commerce.

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NUMBER: THE LANGUAGE OF SCIENCE—*By Tobias Dantzig, Ph.D., Professor of Mathematics, University of Maryland, 260 pages, 5¾x8½ in. Illustrated. Indexed. Cloth board covers. Published by The Macmillan Company, 60 5th Avenue, New York, N. Y. Price $3.50.*

All know in a vague way the important rôle played by mathematics in the metal-working industry, but few understand exactly what one is doing with mathematical symbols when he uses them. Dr. Dantzig will enlighten them. He steers his subject in a safe channel between the two extremes of technicality and superficiality. The origin of the zero, the use of symbols, the notion of infinity, and the various theories of the last number are only a few of his subjects.

This well-written book may contribute nothing tangible to the pocketbook of the engineer and production man, but it will add to his mental equipment and worth.

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WERKSTATTGERECHTES KONSTRUIEREN, REGELN UND BEISPIELE (DESIGNING MACHINERY FOR ECONOMICAL MANUFACTURING, RULES AND EXAMPLES)—*Compiled by Dipl.-Ing. A. Erkens. 26 pages, 8¼x11⅝ in. Illustrated. Paper covers. Published by Beuth-Verlag GMBH, Berlin, S14, Germany.*

Another of the VDI pamphlets under the general title of "Group Construction," this one goes through the complete process of making steel castings of machine parts. One complete section is devoted to elimination of shrinkage stress troubles. The pages are in the nature of loose data sheets, plentifully illustrated, comparing correct and incorrect design from the production angle, such as the elimination of cooling stresses and design factors affecting heat-treatment, polishing, and other processes.

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A.S.T.M. STANDARDS; 1930 EDITION—*Part I, Metals, 1,000 pages, Part II, Non-metals, 1,214 pages, 5¾x9 in. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price, cloth board covers, $7.50 either volume, or $14 for both; half leather, $9 either volume, or $17 for both.*

A.S.T.M. Standards, issued triennially, are recognized as authoritative in the field of engineering materials. The present edition contains the 430 standards adopted by the society, 179 dealing with metals and 251 non-metals.

EXECUTIVE FORUM

Food for Thought

DURING NOON hour the plant cafeteria was the most active department in the Cummings Electric Company. The room buzzed with conversation and the rattle of dishes. At the executives' table in one corner sat Richard Carlson, the Personnel Director, and Warren Russell, Chief Accountant.

"Good menu today," commented Carlson, attacking his steak with enthusiasm.

"Yes," Russell agreed, "all the meals are good here. But I'm afraid we're getting more than we pay for."

"Trust an accountant to spoil a good meal," said Carlson with a laugh, "but you can't hurt my appetite."

"Nothing could," said Russell. "But seriously, this lunchroom didn't break even last year. There was a small deficit on the food itself. Besides that, we reallocated departmental floor space to distribute overhead properly and found the lunchroom isn't carrying its share. The company receives no rent for the use of this room."

"Maybe not in your moss-covered books," said Carlson, "but by providing wholesome food, it adds to the contentment of the organization. The added cheerfulness and physical well-being of the force is ample return."

"Noble sentiment," said Russell. "Nevertheless here is a considerable footage of plant floor space which must be heated and lighted. It should carry its part of the taxes, interest, insurance, and other items which constitute fixed expense. A basic principle of our cost system is that each department must carry its share of the burden. If we don't include the cafeteria, we'll have to increase the rate on the production departments, which in turn adds to manufacturing costs."

"And if you put it on the cafeteria, it'll raise the cost of the food or lower its quality," said Carlson. "You're certainly picking a poor time for a move like this. Some of the men are working part time which reduces their income. They know the company is economizing, but any attempt to cut corners on their food would be resented. I'd suggest forgetting it for the present."

"I don't say the lunchroom should make a profit," said Russell, "but it shouldn't be a load on the company. The men who eat here expect to pay for what they get. They'd be the first to object to running the lunchroom on the basis of charity."

"Take a look over there," advised Carlson, indicating a table where Pete Billings, the toolroom foreman was making a rough sketch on the back of an envelope. Several of his tool and diemakers were watching attentively. "I'll bet those fellows are hatching ideas that will save money for the company. A lot of men talk shop in this room—you and I for example. It's a sign that men are interested in their jobs, and in the long run, it pays dividends. If your scheme goes through, instead of constructive conversation, we'd sit around and kick about the food and the prices. Some of the men would go around the corner to Tony's. Either way the company would be the loser."

"Where will I charge the lunchroom overhead?" asked Russell.

"Just where you've charged it for the past ten years," said Carlson. "Keep on forgetting about it. Don't let your figures loom so large that they hide the men who make them possible."

■

What Do You Think About This Problem?

Company lunchrooms have been found to be an asset, especially in localities where other restaurant facilities are inadequate. Some of them show a profit, others break even, while still others show a loss. Usually the company looks upon this activity as a service to its employees and not as a source of profit. But should it sell a good quality of food at low prices if this practice shows a deficit month after month? In determining the cost, should the lunchroom stand its share of overhead as do other departments?

. . . Discussion
of Executive Problems

■

One Big Family

The big family idea is un-American in spirit and practice. It would be no exaggeration to say that billions of dollars have been thus wasted that should have gone into the pay envelopes. To have the president get sentimental at employee gatherings and tell us that we are all his boys, and that he'll do right by us, if we'll do right by him, may give some of us a thrill, but it doesn't last long. We have heard so many such hysterical outbursts, from officials, and the next day were informed by the sales manager, or foreman that "We lost money on that last job, and if you guys don't drag yourselves, you'll be out of a job."

The American workman is an intelligent being, and he resents the fatherly attitude of such employers. He does not take to the idea of group games directed by some high salaried personnel director, nor that of having the company mix in his personal affairs.

The house paper is good stuff, so is baseball, but put the personnel and welfare directors' salary into a well equipped hospital, where injured men can get real first aid toward regaining their wage earning faculties, provide incentives for devising better ways of doing work, sanitary conveniences, or group insurance.

After a man has finished his work under best possible conditions let him amuse himself, or play as he likes, and he will appreciate it, and have more respect for the company.

—JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

The Fewer the Higher?

The avowed policy of many companies has been to charge all the traffic will bear for repair parts. This policy is shortsighted. Eventually it is recognized by customers and considered when new machine purchases are in prospect. On the other hand, a legitimate profit is due the manufacturer on all orders. If it is necessary that a part be made up under unusual and expensive conditions to satisfy a customer's requirements, he should be frankly advised of the true state of affairs, and given an alternative bid based on immediate delivery of a special lot and on future delivery upon completion of the next contemplated stock order. A possible solution that would in some cases save money for the customer and still give him prompt service would be to process a standard lot of parts, assuming that they are of current design, charging him the standard price based on the regular cost, plus the additional interest and storage charges involved in carrying the remainder of the lot in stock until needed.

Basing our calculations on the data supplied, the cost would figure as follows:

Operation	Labor Hours 8 Pcs.	Labor Rate	Total Labor	Burden Rate	Total Burden
Planing	84.0	0.82	$68.80	2.30	$193.20
Boring	11.2	0.74	8.30	1.90	21.28
Drilling	16.8	0.66	11.08	1.56	26.20
Chipping	4.8	0.52	2.50	1.32	6.34
Totals			$90.68		$247.02

Burden $247.02
90.68

Labor $337.70 ÷ 8 pieces = $42.21 each
Material 100.65

$142.86 total cost

Assuming that it would be necessary to carry the extra seven parts for, say three months, and the cost of doing so amounted to ten per cent per annum, our price, as suggested above, would be arrived at as follows: 7 pc. × $142.86 (unit cost) = $1,000. Ten per cent of $1,000 = $100. Charge for 3 mo. = $\frac{100}{4}$ = $25. Then $142.86 + 25 = $167.86 total cost, which is $7.96 less than Craig's cost of $175.82.

—W. B. LINCOLN, JR., *Chief Engineer, W. J. Savage Company.*

Sales Per Schedule

Although rules will always have their proper place among a sales force, it is not always wise to confine salesmen to any strict selling policy. The salesman with initiative is particularly hampered. Usually the alert, ever-watchful salesman, in the most unfamiliar territory, and under conditions that less gifted men would find wholly disheartening, is quick to size up the situation and sense just where to turn an extra sale. Arriving in a new town, during a snow storm, such a man will go out and he will not come back without a sale. If he doesn't get it from his first prospect, he turns elsewhere.

A set restraining selling policy, for the resourceful salesman, is wrong. It restrains and discourages him. After all, he is accountable for the orders he turns in. If he is under his quota, under a restrictive sales policy, the salesman has a sound excuse. With greater leeway permissible, there is no ground for such excuses.

—FRANK V. FAULHABER.

Salesmen in the Shop

Salesmen in these days have become the most important factor in a firm's organization, and anything that will stimulate their activity is to be welcomed. To be away for months, and on returning, refused admittance to the various departments would be a nasty pill to swallow. These men, fighting in the open market to sell its goods, are alive to the firm's interest. The firm means

something more to them than mere bread and butter; and to witness the creation of the product they sell has an irresistible appeal.

The salesmen fresh from their interviews with critical buyers can give valuable advice to the works manager or the foremen. A walk around the works keeps them in touch with things; any new method of manufacture is noted, any new material used, or interesting operations developed are all added to their armory of selling persuasions. Such is the salesman's viewpoint, but what effect has their visits on the men or foremen? The danger of salesmen giving orders in the shop is not very great; most salesmen know the ropes too well to make such a blunder. They perhaps chat with a foreman or workman for a few minutes, telling of orders won and lost, of searching questions by buyers, and words of praise from satisfied customers. In short, the salesman brings the vision of the customer to the shop. All this helps the men in the shop to realize that the firm's product is having to stand on its own in the world's market and may lead to a desire to improve the standard of the work going through the shop and to speed up production.

—R. G. HEWITT,
Yorkshire, England.

Square Deal or New Deal?

When a manager from outside is appointed, it indicates that it is the considered opinion of the directors, that the subordinate who appeared to be directly in line for the job does not possess attributes essential to good management. It is reasonable to suppose that this particular man would be the last in the world to admit the soft impeachment, and nothing is more human than that he should resent the importation of another chief.

To let that resentment show itself in the deliberate retarding of production, however, merely shows that the directors' opinion of him was accurate. If the attitude is persistent it would most certainly justify the new manager in dismissing him. A good straightforward talk by the manager in his private office should overcome the difficulty, and turn a disgruntled obstructionist into a loyal co-worker. —A. W. WILLIAMS, *Chief Estimator, Bristol Motor Construction Works, Bristol, England.*

Dole or Control?

Undoubtedly avoidance of business fluctuations is the fundamental solution to depressional unemployment, but although we are learning, we are still a long way from knowing just how to apply this solution. In the meantime, there is privation and suffering. Where a relatively small percentage of a country's population cannot find work because of a depression, seasonal or cyclical, the major part of the population has the responsibility of supporting those whose labor is sometimes required. It is immaterial in principle whether this duty is carried out on behalf of all by a State organization or by individual companies. In practice, the State is preferable, since then the duties will be carried out in a uniform manner. The essential part of the scheme of unemployment help is that all who may require help shall contribute regularly; in other words, a national employment insurance.

In Britain the amount of help given only allows a bare living, which cannot conceivably be desired by any but 100 per cent work-shy men. The burden on industry is the most quoted difficulty. Is it so terribly heavy? In round figures, it is a big sum, but expressed as a percentage of labor costs it ceases to impress one. Admittedly, cases of abuse have occurred with the system in Britain, yet a State scheme, modified perhaps to take account of various grades of workers, is the best way of distributing the burden of unemployment from the few to the many.

—S. A. KNIGHT, *Irak Petroleum Company, Tuz Khurmatu, Irak.*

Speculating in Personnel

When trade is depressed, it is inadvisable to lay off any person whose services would be valuable when trade again gets in full swing. Although men can always be taken back, the chances are that they may have other employment and that their services will be lost to the original company.

Replacing these men will be difficult and perhaps impossible within a reasonable time. When the financial circumstances make it necessary to lay off men, I would recommend the following:

Any executive to be laid off should be given a distinct understanding that as soon as prosperity returns he will be re-engaged, and that his post will not be filled without his first refusal. He will be placed on the works unemployed list and will receive a certain amount of unemployment pay on his giving an understanding that he will not seek service with another company. When any person gains other employment, the company should have an agreement with him that he will give his services in a consultive capacity if desired. —W. E. WARNER,
Herts, England.

Home Work

The man who uniformly works at home is the unusual type. He may be a genius and thereby get his pleasure and recreation from the feeling that he is achieving a certain goal and would not be satisfied unless his mind were constantly at work. He would not relish bridge, golf, or hunting. His pleasure would be in figuring or experimenting until his efforts brought results. This type of man would not fit in every position. He would be unfit for supervising or executive duties, because of his natural inclination to concentrate on only one or two thoughts. He would not get the necessary broad viewpoint of the well-rounded and versatile executive who likes to vary his work with play. The old adage is as true now as ever.

To leave your work at the office or factory is the natural thing to do. It allows your physical and mental energy to react to other interests, and in so doing, relieves the pressure and strain so that the next day will find you fit to tackle the job again. To the normal person, this reaction is absolutely necessary to carry on; otherwise the human machinery sooner or later breaks down and the work suffers. It is not a good policy to vary one's work with a wholesome hobby?

—H. EZRA EBERHARDT,
Gould and Eberhardt.

Short Cuts in Die Making

W. C. BETZ
Master Mechanic, Fafnir Bearing Company

There are numerous instances where a built-up die is preferable to a solid one, whether considered from the standpoint of accuracy, first cost, or upkeep

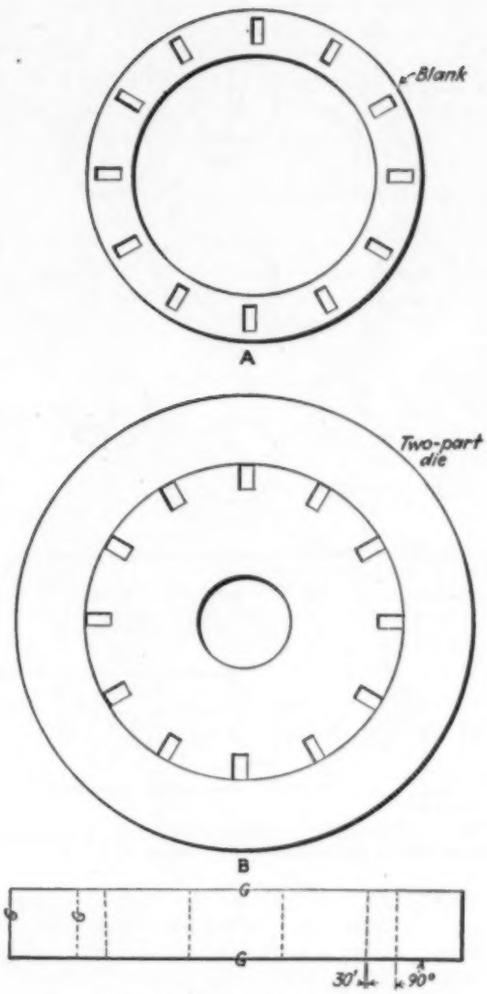
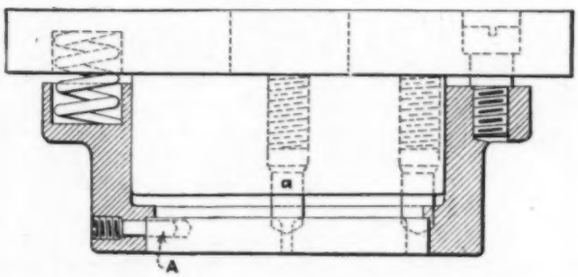


Fig. 1—The two-piece die with milled slots in the central body obviates the difficulty of machining rectangular slots in a solid member



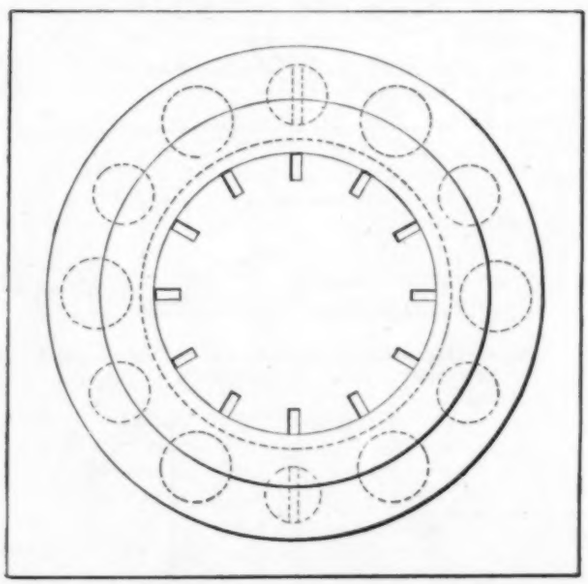


Fig. 2—Punch and stripper set for the die shown in Fig. 1

OFTEN in tool design there arises the problem of accurately spacing irregular shaped holes both in linear and arc measurements. The problem of machining these holes economically is also of paramount importance. Any tool designer knows from experience that it is not an easy task to lay out a die or tool so that the tool maker can produce work that is to be accurate to the fourth decimal place.

Suppose that we wanted to make a die to pierce slots in the piece shown at *A*, Fig. 1—these slots to be spaced within plus or minus 0.001 in. To lay out the slots in a die, drill, and file them to these limits would be out of the question, to say nothing of the cost. But by making the die in two parts, as at *B*, the spacing for the slots in the central part may be done on a dividing head using a saw of the right width to cut the slots. If the die did distort a little in hardening, and the spacing had to be kept within exceptionally close limits, the distortion could be corrected by disk lapping with a diamond-charged disk, or ground with a rubber-bonded wheel.

After the central section of the die is slotted with clearance at the bottom, the clearance is filed on the sides, the bottom end being given twice the angular clearance of

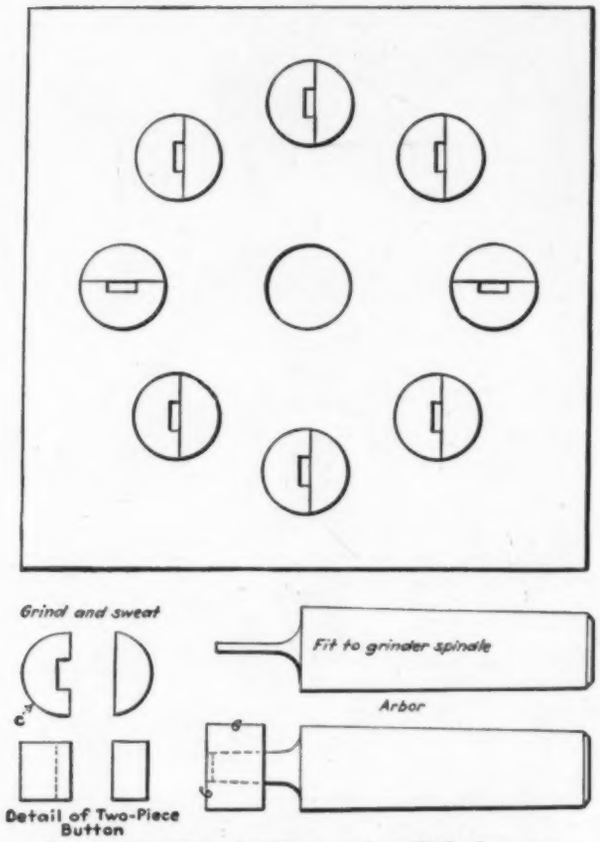


Fig. 3—Two-piece bushings with milled slots are pressed into accurately spaced holes in the die body

the sides so that the inside of the encircling binder ring need have no clearance. After hardening, the periphery of the inner section is ground to size and the inside of the encircling ring ground to a snug fit with the inner section.

In Fig. 2, the corresponding punch and stripper set is shown. Each punch, of which only two are detailed, has a snug fit in the punch body and is backed up by a fine thread screw. These punches are turned from round stock, milled to shape, and are short in length to insure rigidity. For the two stripper pieces, oil-hardening steel is selected to avoid distortion in hardening, as these pieces must be fitted together to drill the dowel holes *A*.

Another way to make a die of great accuracy in spacing is shown in Fig. 3. In this die the body is bored with eight holes accurately spaced to receive corresponding two-piece buttons shown in detail in the lower part of the illustration. These buttons are made as follows: Segments of two round pieces about 1/32 in. larger than finish diameter, and of equal length, are shaped or milled so that when placed together they will form a cylinder. A slot is milled in the larger segment about 0.005 in. deeper than finish width, and all taper clearances are finished in the miller. After hardening, the pieces are ground on their adjoining faces to remove the excess 0.005 in. of material to bring the slot to width, and to clean up the face of the other half. Then the faces are heated, tinned, and sweated together so that they can be slipped onto a special arbor, carefully machined to the slot shape. This brings the work perfectly central with the shank.

The arbor is inserted in the grinder head spindle, and the outside diameter of the assembled die bushing ground to a light drive fit in the die piece. At the same time the face of the bushing is squared with the diameter.

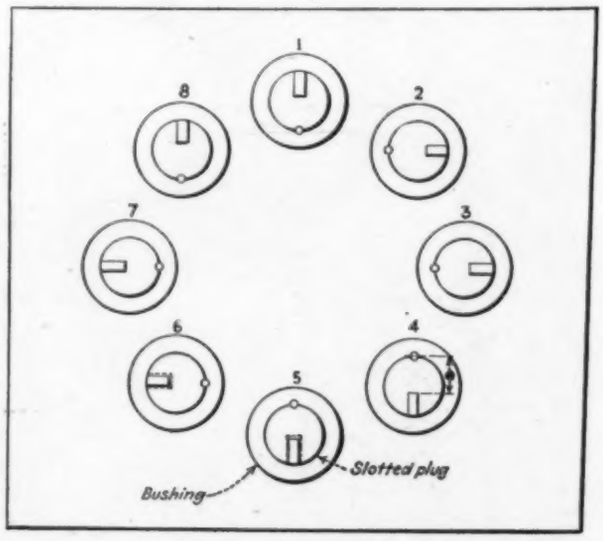
Another solution of the same problem is shown in Fig. 4. The bushing is made on the same principle as the die, Fig. 1; that is, a slot is milled in a cylinder and an encircling ring is pressed over it, completing the rectangular opening. Care must be exercised in driving the slotted piece into the ring to avoid springing or closing the slot.

The slotted members of the bushings are made in pairs so that after hardening they can be ground readily to the desired accuracy. By using the special arbor, illustrated, the outside diameter of one member of the pair can be ground true with the slot while the other member is clamped in the arbor with a setscrew. At the same setting, one end is also ground, then the piece is reversed, and the other member finished, after which they are broken apart. Finishing of the fractured end surface is accomplished on a surface grinder.

In using the bushing-type dies, however, some sort of gage must be provided to insure that the slots are in the right relation to the center of the finished die.

As all slots must bear some relation to the center line of the die, the next step is to insure that the slots in the bushings are true in this respect. This is a simple matter when the slots are radial as in the die shown in Fig. 1.

For this purpose the gage, Fig. 5, may be made. It is used as follows: The center of the die proper must be bored to receive the shank of the gage. In the gage arm, a slot is milled in the edge to the desired position and depth, and the gage tongue soldered in the slot. One of



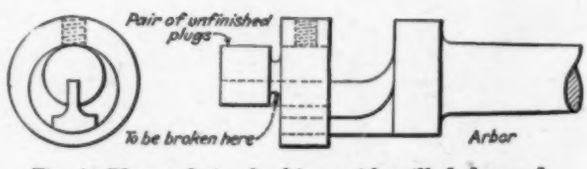


Fig. 4—Plug and ring bushings with milled slot, and the arbor used in finishing them in pairs

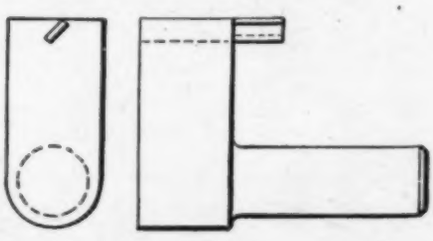


Fig. 5—Gage for angular location of bushings in die body

the bushing assemblies is slipped over the tongue, and the shank is pushed into the center hole of die until the bushing bottoms in the die, the operation being repeated with all the bushings. The gage is also used for inspection.

This principle of machining openings in dies also applies to work in a linear direction. For instance, in the making of dies to produce hexagon or other irregular shaped holes, the bushings may be made in halves, the openings milled to size, and all clearances finished in the milling machines.

For extremely accurate spacing, or where work must be accurate to limits closer than ±0.001 in., one of the new type of optical dividing heads or other extremely accurate dividing devices must be employed. The commercial dividing heads cannot be relied upon to space more closely than ±0.002 in. on a 2-in. radius.

■

Clean Workshops

W. LESTYE

JOHN R. GODFREY'S remarks on page 940, Vol. 72, regarding clean workshops could be multiplied a thousand-fold. Many executives never look above the floor—as though it were the only place where dirt collects. Yet cleanliness should extend to windows, walls, pillars, and furnishings. One sometimes wonders how we maintain close limits with so much dirt and dust around.

Buildings with V-shaped roofs appear worst in this respect. Many a morning it has been possible to write your name on the bed of a planer in the dust dislodged by the wind overnight. When it has fallen on the lubricated parts it is particularly bad. For besides being difficult to remove, such penetrating grit is not good for the machine. Another lodging place for dust is the lamp shades. One was accidently disturbed in the drawing office recently and a shower of dust came down on top of an unfinished drawing.

In one modern plant known to the writer, it is customary at certain periods to wash down the walls, remove the dust from the beams, overhead pipes, cables, and the like by vacuum, and to clean the windows. Apart from the hygienic point of view, there is a freshening of interest in the work, the machine and the person. A clean, wholesome atmosphere is conducive to personal pride not simply in overalls and tools but in a man's machine and work. Dirt, like noise, is an ever-present evil, and where it can be lessened, the results obtained are well worth the trouble and expense.

■

Saving Industry's Eyes

JOHN TALBOT

STRIKING answers were received to a questionnaire sent out recently by the National Society for the Prevention of Blindness to some 1,800 industrial concerns representing the entire membership of the National Safety Council. Included in the membership of the Council are plants in the following industries: Metals, Chemicals, Quarrying, Automotive, Steam Railroads, Cement and Mining, the industries in which serious eye hazards are most prevalent.

In response to the questionnaire, data were secured for 1926 and 1927 from 583 plants employing an aggregate of 578,396 goggle-wearers, among them 166 metal-producing or metal-fabricating plants, 149 plants engaged in miscellaneous forms of manufacture, 25 plants in the automotive and allied industries, 10 foundries and machine shops, and six in locomotive and car-building operations. All told, there were definitely recorded during 1927, cases of 2,650 workers who had one lens pierced, shattered, or spattered with molten metal or injurious chemicals and 1,974 men and women who had both goggle lenses pierced, shattered or spattered, a total of 4,624 cases. During the previous year, 1926, a total of 2,787 cases were reported in the questionnaires, making a grand total of 7,411 cases in two years. A little study of the saving may be enlightening.

The average compensation for the loss of one eye seems to be about $1,800; the average compensation for loss of sight of both eyes is about $3,500. On this basis, the 583 plants covered by the 1927 study saved $8,377,200 in workmen's compensation during the two years by saving 4,654 eyes. These companies saved themselves an additional $9,649,500 by saving 2,757 men from total blindness. The combined saving in compensation costs alone, therefore, is $18,026,700. A similar analysis of the total saving to workmen would reveal a total of $10,689,030. These sums would buy a good many pairs of goggles.

■

Fifty Years of Machinists' Tools
Discussion

CHESTER H. FRANKLIN

ON PAGE 249, Vol. 73, Joseph Hewes makes the statement that we had accurate standard gages of fifty years ago. This, it seems to me is open to question, unless we consider accuracy as a very flexible term. We had gages to be sure, and called them standards. I still have an old set that was kept for checking work that was to be extra fine.

But I am reminded of what the late Worcester R. Warner told me regarding the standard ring-and-plug gages made by the Pratt & Whitney Company for their exhibit at the Philadelphia Centennial in 1876. They made a fairly complete range of sizes well in advance of the exhibition. Before shipping them, however, he started to show a friend how nicely they fitted, and found that not a single plug would enter its ring. The change, or aging, had expanded the steel. So, before shipping, they lapped one pair to a good fit and used that as an example.

This is no reflection whatever on the men who made the gages. They had not the steel we now use, nor had they the experience in changes due to aging, nor did they understand heat treatment as we now know it.

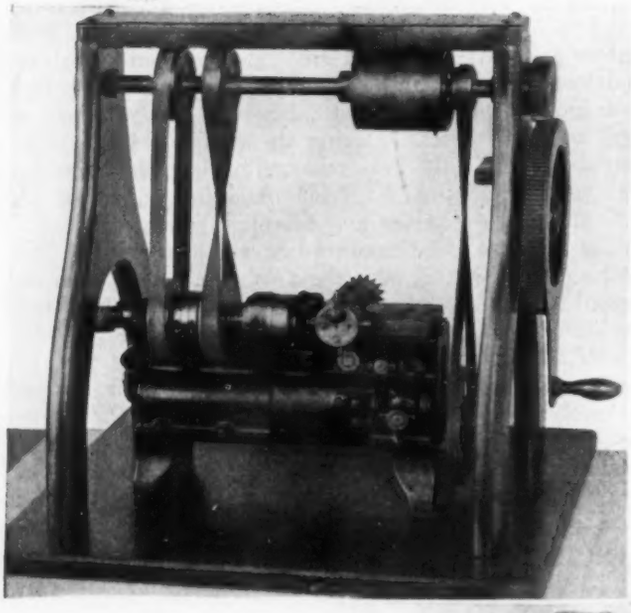
It would be interesting to know how Mr. Hewes checked his gages to 0.00004 in. at the time he mentioned.

■

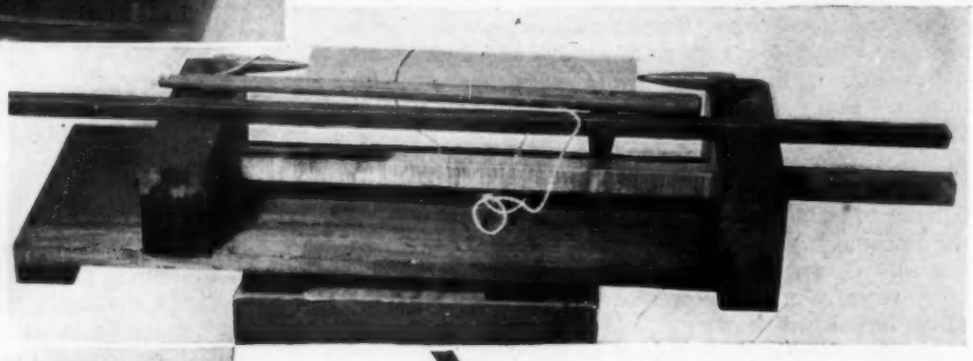
Unless ground rings are used in a cylinder, it is better not to have the cylinder wall dead smooth. Small scratches, although not easily measurable, are considered very helpful in seating turned rings in their cylinders.

LATHES OF LONG AGO

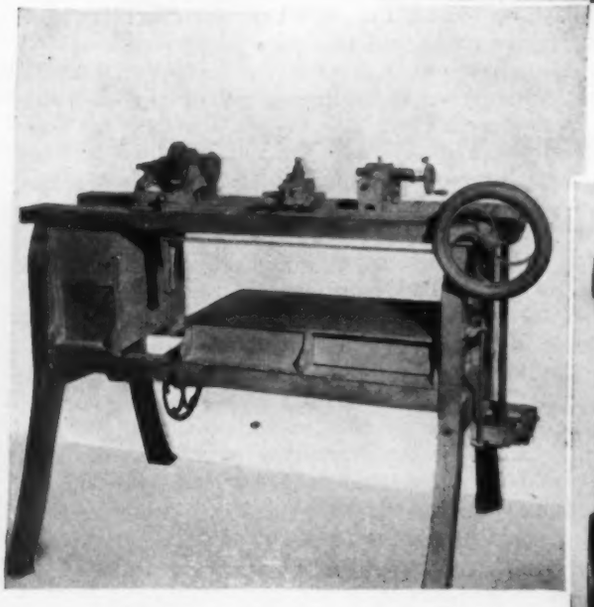
THE LATHE, among the most important of present-day tools, is also one of the oldest. Examples of early models, now on exhibit at the Museum of Science and Industry in the City of New York, are here shown.



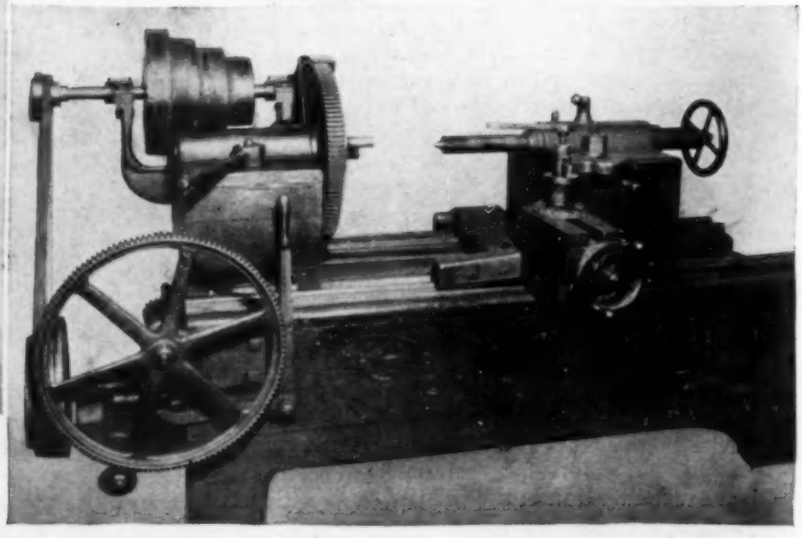
(Left)
A model of the Blanchard lathe. Although not the first to turn irregular forms, Blanchard developed the first practical lathe for the work, a type still in use today



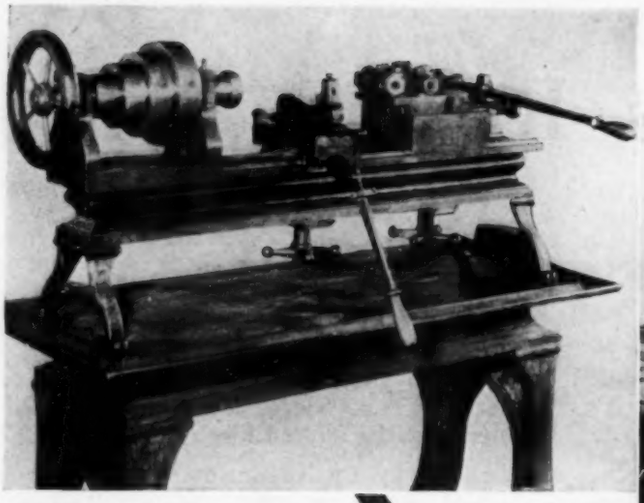
(Right)
Model of an Egyptian bow lathe for wood-turning. Adjustable centers were incorporated, and the piece was turned just as were early drills

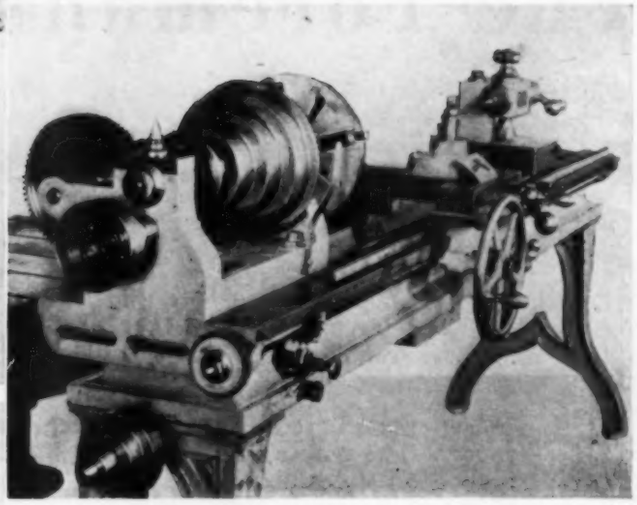


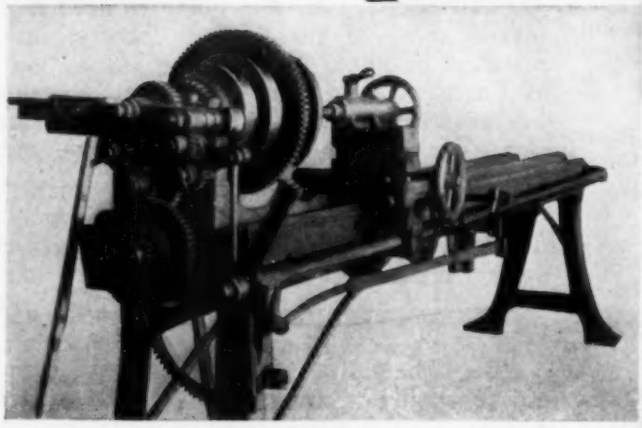
(Above)
The original Putnam lathe, donated to the Museum by Manning, Maxwell & Moore

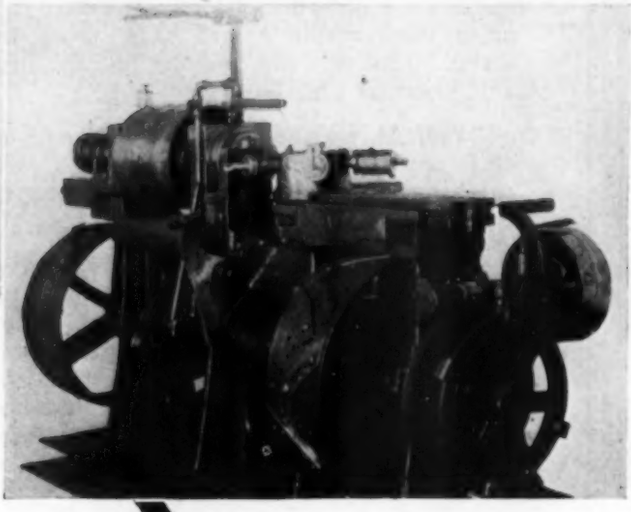


(Below)
An early American lathe, built about 1830. Donated by the Whitin Machine Works





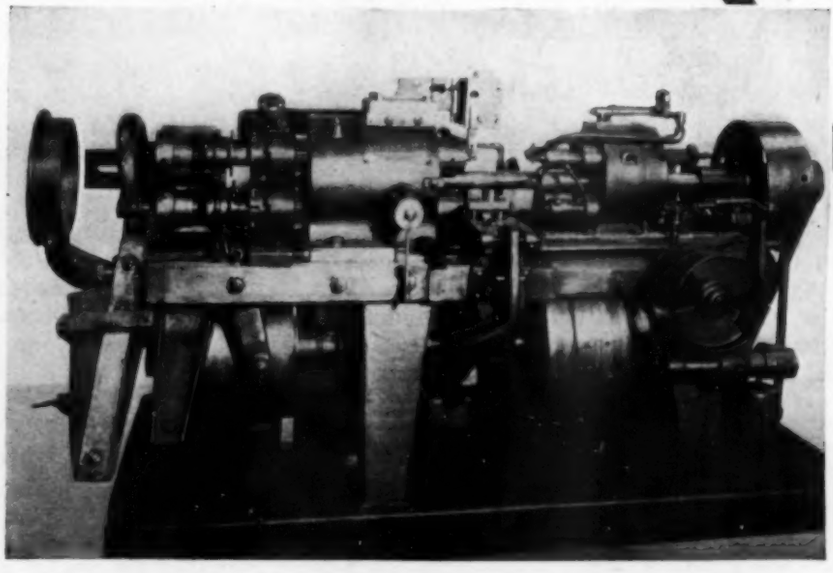




(Top Left)
The first form of turret lathe, built by Lamson, Goodnow & Co. about 1862

(Above)
An early engine lathe, built in America about 1835

(Top Right)
Robbins & Lawrence engine lathe of 1852. This one was used until 1920



(Above)
One of the first Spencer automatic lathes

(Left)
The original 4-spindle automatic. Donated by the National Acme Company

The Foreman's Round Table

NO EXCEPTIONS

"WELL, Solomon Junior, I'll give you a problem that will balk even you!" said Al, as Ed and his wife walked in for their weekly evening at Al's house.

"Oh yeah?" returned Ed, "Go ahead—shoot. The wife and May have a big discussion on styles planned anyhow."

"It's a long story, Ed, you'd better draw up a comfortable chair. The thing that started it all was that blanket no-raise order at Christmas time."

"Yes, Al, I remember. Why should that start any trouble? There wasn't an exception in the whole place—even executives, from what I hear."

"It didn't cause much trouble. Even though a lot of men were disappointed, only one of them did anything about it. I don't know whether you know Lacey or not. He's only been on about a year—sort of a noisy youngster, but one who gets as much done as any man in the gang. You know, one of these fellows that likes to tackle every hard job that comes along, and is always figuring out new ways of doing things. He isn't getting as much as other fellows with the same experience, and he's been having hard sledding financially. He's even worked nights to make a few cents on the side. Well, this morning, Lacey came to me and said he was thinking of quitting."

"The poor simp! In these times?"

"That's what I thought for a minute, too, Ed. But then I started to ask questions. The boy, when he didn't get a raise, just naturally went out and looked up a new job. He showed his sense in getting a job before he mentioned quitting. Jim Judd over at the engine plant is needing a good all-around man with some executive ability to sort of understudy him. Lacey is just about the man he needs, so he offered him the job."

"Then why not let him go?"

"Can't do it, Ed. I'm going to need him myself some of these days. Scotty, that assistant of mine, isn't turning out as well as I'd hoped, and Lacey looks best for the job eventually. I've told him that much. But I can't give him an advance now—and Jim Judd's offered him one."

"Well, let him drift. There's always another bean in the pot. If Lacey wants to get uppity, let him go; there'll be another one along, Al. No man has a right to hold you up on a price basis."

"But if he didn't recognize his own worth, Ed, I wouldn't want him around. I expect my men to kick when they figure they've got more coming than they're getting. I want them to."

"Well, I don't. I'll get 'em raises when they deserve 'em—no sooner. But even if I don't get 'em raises, anybody that goes scouting for another job had better take it—'cause I'll fire him either way it goes. If business is on the bum, any man should be darn glad to have a job, let alone worrying about a raise."

"Then you believe in the Rule, with no exceptions, Ed?"

"I certainly do. I can't see why any man deserves special consideration after a blanket order has been put through."

"Well, Ed, I still disagree. That youngster's got a raise coming, he needs it about as bad as the company needs to make dividends, and remember, Ed, he's got another job—blanket order or no blanket order."

How can outstanding initiative be recognized, even when a "blanket order" seems advisable? Should valuable men be saved, in spite of blanket orders?

▸ ▸ ▸ Discussion of Former Topics

By Their Presents

A present of any kind from a subordinate or subordinates is either a petty form of bribery or one of two kinds of tribute. If it is considered as a bribe and a lever for future favors, we cannot do any good by discussing it. If it is a tribute to his power, including hiring, firing, handing out the good jobs, overtime and winking at breaches of discipline, these too are unworthy of discussion.

When the present is a tribute to either his ability which has helped keep the plant running nearer full time than other plants during a lull in business, or his kindly and helpful interests in all of his men both inside and outside of the shop, no management has the moral right to legislate against a free-will offering of a present to this foreman.

It is in the methods of receiving the cash, choosing the present and delivering the gift that even the best of intentions may go astray. My suggestion about acquiring the cash would be for one or more to canvass the department merely stating that, "A present is going to be given to the foreman, and if you wish to give anything towards it please hand it to me by December 20th." Then the receivers of the money would decide what to buy or to give the cash to the foreman. In delivering the present it should be laid on the foreman's desk during his absence with a typed note that it was from his men as a token of appreciation of his helpfulness during the year. He should not know who started it, who contributed, or how much any man gave.

The only other time a present is appropriate is when a foreman or superintendent is retiring or leaving the plant for a job in another plant of the company's or for a job with another company.

—E. E. GAGNON, *Mechanical Superintendent. Raybestos-Manhattan, Inc.*

Who's Who in Industry

This aspect of production deserves attention by management in nearly every class of work, but especially in the mechanical. It is quite refreshing to learn of an instance where experience and skill are remunerated more highly than repetitive semi-skilled work. The manager who so acted deserves an everlasting memorial for originality. I have yet to meet such a man. There was method in his madness, and it is regrettable that so few rise to this height. The contrary is usually the case. Employers and production engineers act as though only bulk counts. Toolmaking, pattern making, draftmanship, and brainwork, yea, even supervision is allowed to continue only as a necessary evil, paid as low as possible.

While admitting that production is the backbone of industry, the above anomaly is a reproach to engineering. It is notorious that brawn, muscle, and speed are more lucrative than experience and brains. The rough turner often earns more than the man doing fine accurate work, more even than an assistant foreman. The writer has known several cases where assistants have given in their notices on this account. Not that the piece-worker who earns the money is to be reproached—it is rather the system which is faulty. It needs men with size-eight hats to devise a more equitable method of payment.

—WILLIAM BRYCE, *Sheffield, England.*

The Worm Turns

Welfare work is very often misdirected as well as overdone. Medical aid, sanitation, plant cleanliness, and safe working conditions are the big points; most of the other things are superfluous. Of course there is a class of labor of low intelligence which must be looked after. It is practically helpless to take care of itself. But the vast majority of workmen resent too much interference. They prefer to be independent and stand on their own feet. They attend to their duties in an efficient manner and take pride in doing their work speedily and accurately.

—L. O. BROWN.

Trade Secrets

Some firms' behavior with what they fondly imagine are trade secrets is ridiculous. Every drawing they issue to outsiders is stamped "Private and Confidential," every innovation in methods in the shops is guarded with jealous care from prying eyes, every idea in new design is regarded as sacrosanct. In their daily business they use ideas developed by other men, but the few they themselves have devised must remain their own exclusive property. Instead of outdistancing competition by safely guarding their secrets, these firms are dropping behind through clinging to old-fashioned methods.

It is a moot point whether such things as patents should ever be granted. Certainly, many of the ideas that do get patented don't deserve that honor. In many cases, a patent is merely the last link in a long chain of evolution. The patentee often forges merely that last link, and forgets the smiths who preceded him and forged the other links on which he depends. Constructive thinking should be rewarded, but is the patent system the best way in which to do that?

—A. W. KNIGHT, *Suffolk, England.*

The Fortune Teller

The personnel department merely takes the preliminary steps in hiring prospective employees, being guided by the requests for new help. By weeding out the undesirables, the foremen are not needlessly bothered by everyone applying for a job, regardless of qualifications. Only those men found fitted for the vacancies at hand are sent to the foreman, who then makes the final decision.

There are other qualifications beside training and ex-

perience which should be taken into consideration before the foreman interviews the man. Will he be permanent? Is he likely to get along amicably with his fellow workers, or is he apt to start discontent among the men? Is the prospect mentally capable for the opening at hand? The particular job open may be considered a stepping-stone to a more responsible position; is the applicant capable of the contemplated advancement?

Any inexpensive means the personnel man may have of arriving at solutions to similar questions, should be used. If a psychology test of all otherwise satisfactory applicants will help, by all means use it.

—M. E. ROTCHY, *Planning Engineer, Celite Company.*

No Parking

Whether a firm is, or is not, progressive has nothing to do with the question of whether it should provide parking facilities for its employees.

Each concern must consider the problem on its merits. In the city, with garages conveniently situated, the management can well expect employees to make their own arrangements for parking cars. Should, however, garages be far from the works, then the employees have some right to expect the firm to take up the question. If the factory is situated in the country, the concern should provide garage accommodation, since the problem of transport facilities to and from the works is a dual problem and the employee has no alternative but to depend on his employer to give him the required facilities.

—A. W. KNIGHT, *Suffolk, England.*

Check and Double Check

The foreman of the department is the one best able to estimate the number of tools necessary for good production. The superintendent should go over the estimates after the foreman, and if there are any items not satisfactory, or if he thinks the foreman is estimating too high, they should get together and straighten the matter out.

The tools should then be put into the tool crib and issued on check.

The tool crib attendant should not only be able to hand the tools out and put them in place when brought back, but should be able to grind tools also.

This will result in a two-fold saving, first by saving the tools from getting lost or laid away in someone's drawer where they are not producing anything, and second by savings due to proper grinding of the tools.

—THOMAS M. GARRY, *Yale & Towne Mfg. Company.*

Wail of the Weak

That question of co-operation bobs up regularly in the Round Table discussions and it seems to be a case of "the more you talk it over, the less you know about it."

I have spent a good many years out in the shop, and it has been no uncommon occurrence to witness the spectacle of a pair of department foremen who were thoroughly antagonistic to each other, yet whose finished product could be depended on to come off the departmental lines and assemble without a hitch, day in and day out, whereas a quite opposite state of affairs might be witnessed in some other section of the shop.

One needs only to count the number of books that have been published on certain phases of shop practice which, boiled down, merely voice the authors' own ideas of co-operation, its meaning and how to make it work, to realize that this question has yet to be satisfactorily answered.

In the present case, the G.M. used good judgment in deciding that the chief engineer would do better in that position, and obtaining a new man for the position of shop superintendent. The shop superintendent is, or should be, primarily a production man, whereas the chief engineer's training has been all in the field of design. The superintendent stands on solid ground when he states that he either makes the part like the drawing, or has the drawings changed. It appears that the superintendent knows his business. If he has backbone and likes a good fight, he will stick to the job. —EDWARD GREENSPON.

Who's Who in Industry

In an industrial world where financial reward is not dependent on speed of hand and eye alone, skill and experienced craftsmanship will always command the higher rate. If that were not so, there would be no inducement for, let us say, the machinist or tool-maker's apprentice. His years of work and study at low wages would be wasted.

To attempt to classify the various trades in order of the degree of skill required, or in their importance to industry, is a problem that has led to many arguments and pointless debates. In the good old days of the saloon, a husky "bouncer" was often the final arbiter.

There are machinists to whom no problem comes amiss, just as there are pipefitters and bricklayers who are artists in their particular line. In the words of an old foreman of mine:

"The man who knows and does, is worth more than the fellow who has to be shown."

The average operator is generally in the latter category. —ROBERT S. ALEXANDER.

A Friend at Court

It would appear from the discussion that it is a friend Ed wants to help out, rather than to organize his department so that his own shoes may be filled by a capable assistant if an opportunity presented itself for him to move on up the ladder.

When openings occur in the jobs higher up, it is well, in the writer's opinion, to have one's work so organized that, when the eligibles are listed, his chances of being selected are greater in proportion if his present position can be readily filled.

This keeping your job a secret so that no one can take it from you is a narrow-minded policy.

On the other hand, the "cracker-jack" abilities of the friend are perhaps a little exaggerated, simply because he is such a good friend or held in such high esteem. Having one work for you may uncover a lot of faults not before discovered.

—C. J. ANDERSON, *Motor Planning Department, Lynn Works, General Electric Company.*

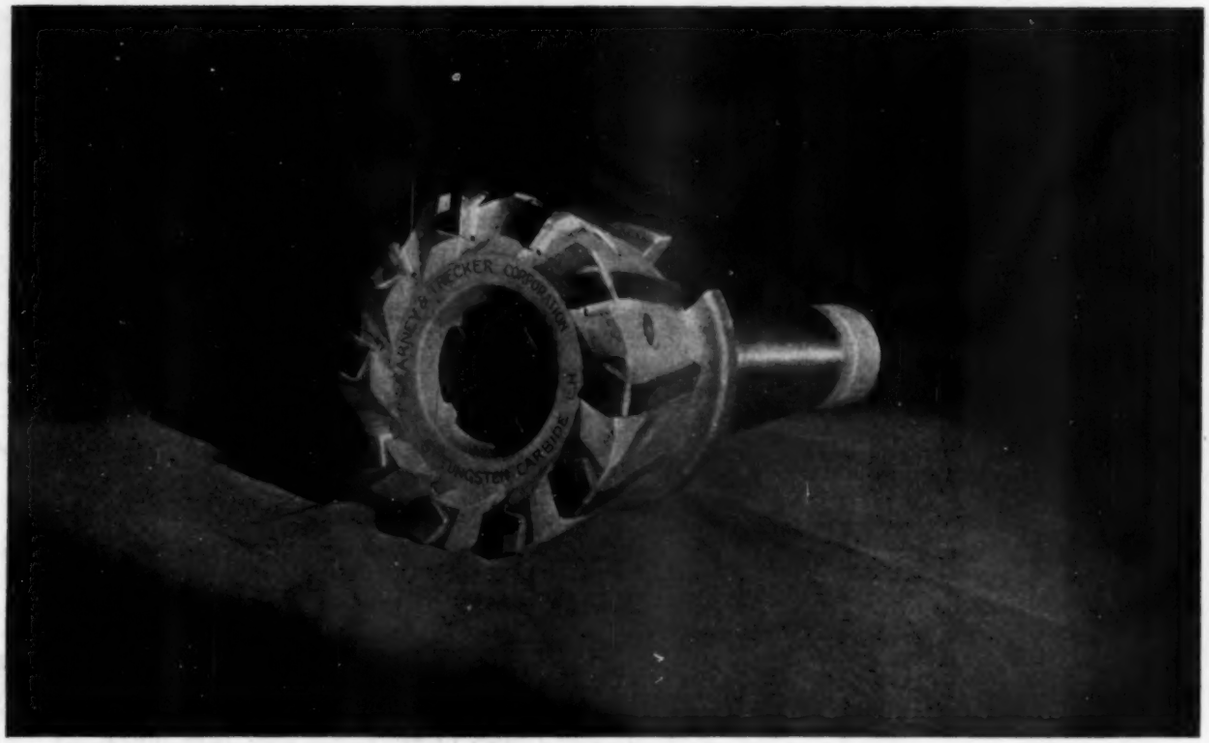


Fig. 1—A 5-in. inserted-blade cutter with chip and cutting clearance cut in the body

Tungsten Carbide and Milling

FRANK H. CURTIS
Research Engineer, Kearney & Trecker Corporation

PERHAPS less has been accomplished with tungsten carbide as applied to milling cutters than in any other form of tool used for metal removal. Of course, there are milling operations using tungsten carbide, but these are few and far between compared to turning and boring. The present high cost of milling cutters equipped with tungsten carbide has a tendency to hinder progress, because there is no guarantee of performance. There is little question, however, that satisfactory results will more than offset the initial cost involved, and it is to be expected that the use of this cutting material will increase greatly as time goes on.

First of all, there is a decided advantage in having a machine basically designed for this new metal, one with ample rigidity and strength to enable metal removal at faster rates, and high spindle speeds suited to tungsten carbide cutters. Next, the cutter must embody a design that affords correct application for tungsten carbide. Here, again, it is a case of rigidity with the addition of proper cutting angles.

When we started experimenting with tungsten carbide, our first cutter did not prove successful because of brazing failure of the tungsten carbide tips. Every effort was made to improve brazing and we continued our development by constructing an 8-in. cutter of conventional design, having 20 tungsten carbide blades. Several tests taught us the limitations of this design. In the first place, when the cutter was stopped in the cut—that is, the spindle stopped with the feed engaged—the blades that were engaged in the cut invariably broke, providing the cut was of medium or heavy nature. The brazing, however, was satisfactory. This condition led us to conduct further experiments with cutter-body design. What was evidently needed was better support and added rigidity.

Our latest cutters are made by inserting the blades almost flush with the face of the cutter body, then cutting chip clearances in the cutter body proper. This design, an example of which is shown in Fig. 1, has been successful and is probably the nearest approach to a fool-proof cutter that we have produced. Several cutters have been made this way and undergone severe tests, and no failures have been experienced. The blades receive proper support directly in line with their cutting edges, and there is no chance for them to spring under pressure of the cut, since there is practically no overhang.

Due to the newness of tungsten carbide, it is almost impossible to give definite recommendations as to speeds and feeds for milling. In the two years that this metal has been used, it is still difficult to specify definite speeds for turning and boring operations. With all conditions satisfactory, there is no doubt that substantial savings can be made.

In many cases tungsten carbide tools have been put to work at satisfactory increases in speed, and production has been increased proportionately. On this basis, the users praise this metal and boast of its remarkable cutting qualities. However, the results secured may not mean the best obtainable, because it is possible that further experiments would still further increase profits. It may be satisfactory to leave well enough alone, but at the same time it is always wise to get the largest returns from an investment.

Tungsten carbide, applied to milling, can be used advantageously for machining cast iron, malleable iron, semi-steel, bronze, copper, and aluminum. For these materials, it is generally safe to assume that the speed of tungsten carbide cutters can be set at two or three times the speed usually used for high-speed steel. On certain types of materials the ratios can be increased, but it is always best to experiment before attempting maximum recommendations.

As to the feed of milling cutters equipped with tungsten carbide, it is well to reduce the feed per tooth per revolution by approximately 25 per cent from the usual high-speed steel recommendations. Sometimes an equal feed per tooth may be used, but here again it is safe to increase only by trial.

An increase in feed and decrease in speed per tooth per revolution is equivalent to higher rate of metal removal. For example, a high-speed steel cutter, 8 in. in diameter, having twenty teeth and cutting cast-iron, can be operated at a speed of 36 r.p.m., or 70-ft. per minute, and a feed of 0.010-in. per tooth per revolution, which is equivalent to 720 teeth per minute, or a feed of 7.2 in. per minute. Under similar conditions a tungsten carbide cutter of the same size can be operated at 200-ft. per minute so that 1,900 teeth per minute pass the work, although the feed should be reduced about 25 per cent or 0.0075-in. per tooth per revolution, which is equivalent to a feed of 14.25-in. per minute—an increase of nearly 100 per cent in feed per minute.

The following speeds can be used with inserted-blade face-milling cutters, assuming of course that the metal being cut is of a free-cutting nature:

Material	Roughing	Finishing
Cast-iron, soft	150 to 300	200 to 400
Malleable iron	175 to 350	200 to 500
Yellow brass	200 to 400	250 to 600
Bronze-ordinary	200 to 350	250 to 500
Aluminum	800 to 1,500	1,000 to 2,000

The feed per tooth per revolution for the above materials, using tungsten carbide inserted-blade cutters, will vary from 0.007 to 0.012-in., although 0.009 to 0.010-in. will be found a good average feed. Sometimes the available machine will not pull this load and it is therefore advisable to reduce the feed proportionately.

So far, tungsten carbide milling has been confined mostly to inserted-blade facing cutters from 5 to 20 in. in diameter. The smaller sizes, 14-in. and under, seem to be more rigid, offering the full advantages of maximum speeds and feeds. With the larger sizes there is more chance of the cutter body springing away from the cut, unless an unusually heavy design is used; then, too, there is a possibility of chatter—an evil that is highly detrimental to tungsten carbide.

In cases where the possible distortion of the work governs the rate of metal removal, it has been possible to overcome former difficulties by the use of increased speeds. Let us consider an actual case. The milling of cast-iron exhaust elbows—a rather frail casting cored in the center—was formerly milled with a 5-in. high-speed steel cutter at 70 ft. per minute, with a 7-in. feed, which was the limit of the cutter and workpiece combined. Any increase in feed beyond 7 in. caused the casting to spring out of shape and the result was an uneven surface. The same job machined with a tungsten carbide cutter at 310 ft. per minute permitted a feed of 21 in. without the least bit of distortion. More than four times the speed and three times the feed. This operation is shown in Fig. 3. At higher speeds the cutting pressure was reduced considerably and it was, of course, possible to increase the feed proportionately. This advantage will be of benefit in plants where thin frail parts are encountered.

Solid-type cutters are being used successfully for certain classes of work, but they have limitations. End mills from 1 to 4 in. in diameter, with tips brazed solidly

Fig. 3—Machining at 1,000 r.p.m. with a feed of 100 in. per minute. Note method of steadying the spindle nose

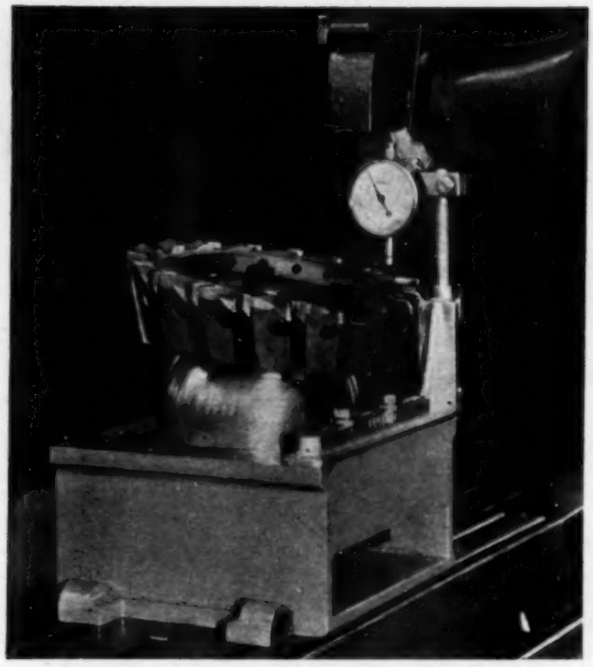


Fig. 2—Semi-universal fixture for holding cutters on an ordinary surface grinder

to the body, work satisfactorily for light cuts on soft metals where cutting pressures are not too great. Plain and side milling cutters with solid inserts likewise can be used with a fair degree of success, but here again only thin or narrow sizes are practicable because long slender inserts of tungsten carbide are likely to break under pressure. For example, a 3-in. wide plain cutter, 3½ in. in diameter, would ordinarily require tips ⅛x¼x3 in., a size difficult to apply without mishap.

One of the most serious problems confronting shops that use tungsten carbide is the grinding of milling cutters tipped with this metal because of the lack of proper grinding equipment. It is just as necessary to have tungsten carbide blades ground accurately and uniformly as it is for cutters equipped with high-speed steel or Stellite blades. The cutting faces should be held within 0.0005 in. of size for finishing and 0.001 in. for roughing, whereas the periphery or outer edges should be held within 0.001 in. for finishing and 0.002 in. for roughing. Where the difficulty comes is probably the rapid wheel wear that takes place when grinding this super-hard material. With ordinary cutters it is possible to set the cutter grinder so that the abrasive wheel will take a finishing cut from all the blades at one setting and thus offer the assurance of uniformly ground surfaces. With tungsten carbide, the condition is quite different. When the machine is set for the grinding of one blade, there is so much wear in the wheel that when the next blade is to be ground at the same setting the wheel will not cut. It is, therefore, necessary to use an individual setting for each blade. The present-type cutter grinder does not have any means of offering this adjustment and the result is that it is very difficult to grind a number of blades accurately enough to insure free-cutting action, or a smooth finish of the work being machined.

Much of the difficulty experienced in grinding these cutters may be eliminated by using a surface grinder equipped with a suitable fixture that holds the cutter solidly as grinding takes place. Such a fixture is illustrated in Fig. 2. Since the periphery of the wheel does the cutting as it passes back and forth over the blades, any end play that might exist in the spindle does not affect the type of finish. Likewise the periphery of the wheel seems to offer a much better means of grinding than the face of a saucer or cup wheel. In other words, this method offers a quick means of dressing the faces of the blades, as well as permitting accuracy to be maintained. Naturally, better grinding and a uniform set of blades offer more life between grinds as well as a smoother finish on the work being milled.

The fixture consists of a base into which a spherical adapter is attached. This adapter accommodates face mills that are either flat on the back face, or those provided with a counterbored face used in mounting to milling-machine spindles. The adapter can be adjusted in almost any direction to offer compound angular settings of the cutter. On the base is located an adjustable bracket that holds a dial indicator. The bracket is made so that the indicator can be pivoted or swung out of the way while grinding takes place, whereas it can be quickly swung over the surface being ground so that a rapid reading can be taken. In this way it is very easy to grind a tooth, check the reading, then grind the next tooth to the same reading, and so on around the cutter.

It is not intended to assert that the present type of cutter grinder is absolutely useless, because such is not the case. What really seems to be evident is the fact that grinding machines must be strengthened and provided with attachments so that individual settings can be made for each blade similar to the method outlined herewith. It is quite evident that there is a market for a machine suited to the grinding of tungsten carbide cutters, but until such a unit has been developed it may be necessary to revert to a fixture such as described, which permits the use of a surface grinder—a machine that is to be found in almost every shop.

■

Skill and First Principles

IN AN address before the Engineers Society of Milwaukee recently, Charles Schoen, works manager of the Kearney & Trecker Corporation, Milwaukee, quoted an article appearing in the *American Machinist* for November, 1877. Under the title "First Principles" this article said in part: "It is a mistake to assume that a mechanic knows all that it is necessary for him to attain, when he becomes skilled in the special kind of work he may have selected. There is a great deal of ignorance of first principles among careful and intelligent workmen; where it ought not to exist. . . . The underlying principles of any business or occupation ought to be made a regular study by those engaged in it, so that the road may be open to them for progress and improvement. . . . Some men apparently blunder into a fair mechanical success, in certain directions, without any regular preparation or fitness, and are always afraid to reach out for something better, lest they lose the hold they have already secured. While all can not be inventors or designers, it should be the aim of every mechanic to know the why and wherefore of especial work, so that he may be rooted and grounded in the kind of knowledge he is required to possess."

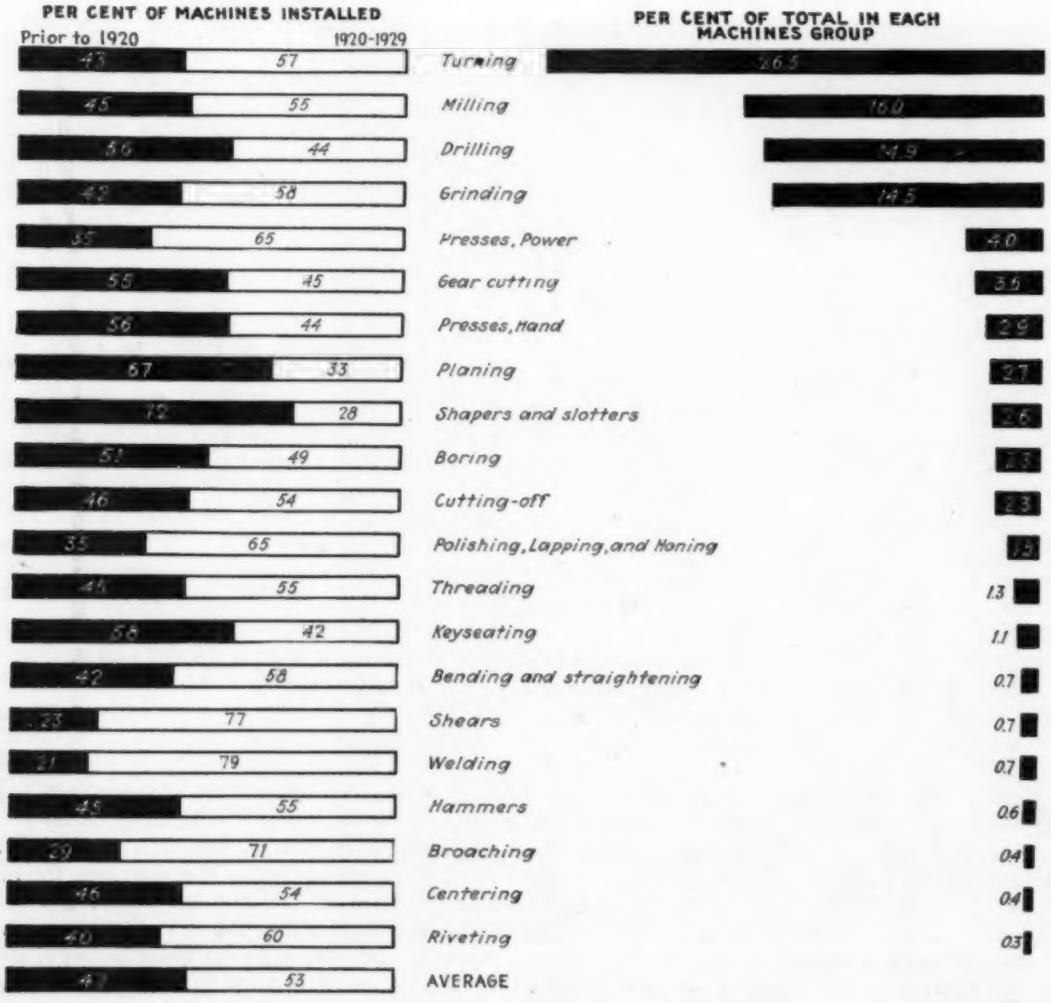
AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

FIVE years ago the inventory published by *American Machinist* comprised sixteen industrial divisions. The current compilation covers 50 per cent more groups or twenty-four in all. The additional reports are accounted for partly by those on auxiliary equipment not included in the 1925 count and partly by separating a number of divisions previously shown as "other machinery and parts." Paper and printing machinery makers fall within this latter classification. This division covers bookbinding, photo engraving, printing, paper-mill and pulp-mill machinery.

Equipment over ten years of age is shown as 47 per cent, a little higher than that obtained as an average for all industries in 1925. Turning, milling, drilling, and grinding are the leading machine groups, together forming 71.9 per cent of all the equipment in place. The machine summary on the opposite page shows over ten thousand units installed as of 1930.

Report No. 23—Paper and Printing Machinery Builders


PER CENT OF MACHINES INSTALLED
Prior to 1920
1920-1929
PER CENT OF TOTAL IN EACH MACHINES GROUP
Turning 43 57 26.5
Milling 45 55 16.0
Drilling 56 44 14.9
Grinding 42 58 14.5
Presses, Power 35 65 4.0
Gear cutting 55 45 3.5
Presses, Hand 56 44 2.9
Planing 67 33 2.7
Shapers and slotters 72 28 2.6
Boring 51 49 2.3
Cutting-off 46 54 2.3
Polishing, Lapping, and Honing 35 65 1.9
Threading 45 55 1.3
Keyseating 58 42 1.1
Bending and straightening 42 58 0.7
Shears 23 77 0.7
Welding 21 79 0.7
Hammers 45 55 0.6
Broaching 29 71 0.4
Centering 46 54 0.4
Riveting 40 60 0.3
AVERAGE 47 53

Machines Making Paper and Printing Machinery

	Total Number in Plants 1930	Total Number in Plants 1920
LATHES		
Engine	1,505	695
Hand Turret	229	68
Power Turret	182	74
Automatic and Semi-Automatic	114	15
Chucking (Not Chucking Machines)	56	19
Speed and Bench	241	127
Toolroom Type	117	56
Other	58	12
CHUCKING MACHINES (Not Chucking Lathes)	31	6
SCREW MACHINES		
Hand	105	53
Automatic, Single Spindle	145	74
Automatic, Multiple Spindle	59	12
CENTERING MACHINES	40	19
MILLING MACHINES		
Hand (No Power Feed)	185	99
Bench	114	53
Plain (Knee and Column Type)	862	393
Universal (Knee and Column Type)	167	87
Vertical (Knee and Column Type)	207	83
Lincoln Type Manufacturing	19	6
Continuous, Rotary Table or Drum Type	3	
Planer Type	83	25
Other	68	25
GEAR CUTTING MACHINES		
Rotary or Milling Type	139	99
Hobbing	56	28
Planing or Shaping	182	77
Other	6	6
BORING MACHINES		
Horizontal Boring, Drilling and Milling	93	56
Vertical Boring Mills	130	62
Other	15	9
JIG BORERS	9	
DRILLING MACHINES		
Radial	362	158
Upright, One Spindle	408	321
Upright, Two or More Spindles	247	102
Upright Gang (Two or More Heads)	28	19
Sensitive, One Spindle	210	167
Sensitive, Two or More Spindles	291	114
Sensitive Gang (Two or More Heads)	15	6
Two, Three and Four Way		
Other	37	6
THREADING MACHINES		
Single Spindle Tapping	71	19
Multiple Spindle Tapping		
Pipe Threading and Cutting	12	12
Bolt Threading and Cutting	22	15
Thread Chasing	3	
Thread Hobbing and Milling	25	12
Thread Rolling	3	3
Other		
PLANERS		
Open Side	37	25
Double-Housing	250	167
SHAPERS		
Vertical	15	15
Horizontal	238	170
Slotters	25	15
KEYSEATING MACHINES	117	68
BROACHING MACHINES	43	12
GRINDING MACHINES		
Plain Cylindrical	176	62
Universal Cylindrical	74	34
Surface, Reciprocating	269	114
Surface, Rotating	74	28
Internal	74	25
Crankshaft	3	
Cutter	182	68
Floor, No Feed Attachments	340	182
Bench, No Feed Attachments	136	40
Abrasive Disk	99	49
Abrasive Belt	56	12
Centerless	19	
Other	46	25
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	121	53
Abrasive Belt, Hand Operated	19	
Automatic and Semi-Automatic		
LAPPING MACHINES	15	3
HONING MACHINES	3	
CUTTING-OFF MACHINES		
Parting Tool Type		
Power Hack Saw	158	71
Rotary Cold Saw	49	25
Bandsaw	31	9
Other	9	9
WIRE FORMING MACHINERY		
Spring Coiling	6	
Other		
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt	3	
Resistance Welding, Spot	9	3
Resistance Welding, Seam		
Resistance Welding, Other		
Arc Welding	22	3
Electric Cutting		
Gas Welding	28	9
Gas Cutting	12	
RIVETING MACHINES, STATIONARY		
Pneumatic	3	3
Hydraulic		
Power	28	9
PRESSES		
Punching Machines	198	80
Combined Punches and Shears	22	9
Hand, Arbor	210	114
Hand, Light Punch Press Work	87	59
Foot, Light Punch Press Work	15	3
Power, Crank Type	62	12
Power, Toggle Type	6	
Power, Double Acting		
Power, Dieing Type		
Power, Trimming Presses		
Power, Forcing, Arbor, Wheel	37	3
Hydraulic, Bending, Forming, Drawing	77	34
Hydraulic, Wheel Forcing, etc.	22	9
Baling, Power and Hydraulic		
Other	12	3
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	22	12
Bending Rolls, Horizontal	22	12
Bending Rolls, Vertical	3	
Straightening Rolls	22	3
Other	12	6
SHEARS		
Knife	62	12
Rotary, Slitting	3	3
NIBBLING MACHINES	15	3
HAMMERS		
Drop	15	12
Helve		
Spring	9	9
Steam	9	6
Pneumatic (not portable)	34	3
Other		
FORGING MACHINES		
Bulldozers		
Hot Forging Machines		
Cold Headers, Bolt, Nut, etc.	3	3
Cold, Swaging		
Forging and Flanging Presses, Hydraulic		
Other Forging Machines	3	
Total	10,720	5,013

IDEAS FROM PRACTICAL MEN

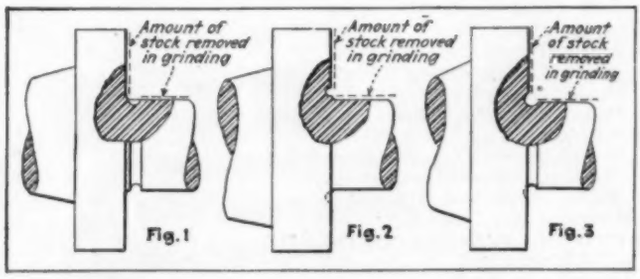
■

Necking for Grinding
Discussion

STANLEY PORRITT

REFERRING to the article by J. T. Towlson, under the title given above, on page 713, Vol. 73, of the *American Machinist,* it is apparent that Mr. Towlson takes it for granted that necking work and the reasons therefor are well understood by lathe hands generally, but I have found this not to be the case. Necking is something that the average lathe hand knows nothing about and seems to care less. Even in toolrooms, very few lathe hands will be found who can explain the necessity for necking, from the grinder's point of view. I maintain that it is as much the lathe hand's business to leave a neck in work to be ground as it is to leave stock on the work for grinding. It should not be necessary to specify necks on drawings, but rather to specify where necks are not wanted.

The main reason for necking is that it allows the planes of the two right-angle surfaces to pass each other theoretically, the intersection of the two planes being the sharp corner desired. Another reason, not always considered and taken advantage of, is that a neck provides


Amount of stock removed in grinding
Amount of stock removed in grinding
Amount of stock removed in grinding
Fig. 1
Fig. 2
Fig. 3

the opportunity for a good-sized fillet in what is in effect a sharp corner. In connection with the first of these reasons, it does not seem to be generally understood among machinists and others that the grinding wheel is a comparatively soft tool, and that the whole subject of necking hinges on the fact that it is commercially impractical to maintain a sharp corner on the grinding wheel, for many reasons. The chief difficulties are that first, a free-cutting wheel is naturally crumbly, and that the corner will not stand up to the lightest dressing with the diamond, and second, that with every traverse over the work, the leading edge of the wheel takes practically the full force of stock removal and consequently wears faster than does the center of the face.

From these reasons it will be seen that the leading corner of the wheel is always rounded. Considering this condition in connection with the sketches in Mr. Towlson's article, it is evident that none of the types of neck shown would be of use for the service intended. The necks in his sketches *A* and *B* are practically the same and would both leave the condition shown in my sketch in Fig. 1, while the condition shown by his sketch *C* would be the reverse and would leave a fillet on the body of the arbor. If we consider the case cited (a milling machine arbor) probably from 0.040 to 0.050 in. would be left to take care of the distortion in hardening. It will therefore be seen that this type of neck becomes a mere groove in the face of the shoulder, as shown in my sketch, Fig. 2, and that the only type of neck of any service to the grinder is a combination of Mr. Towlson's *B* and *C*, as shown in Fig. 3 of my sketches.

I support Mr. Towlson's claim that deep and sharp-cornered necks are likely to cause fractures. Necks should be machined and measured carefully as is the rest of the piece. On short, stubby pieces that will run true after hardening, they should not be allowed to go more than 0.010 in. below the finished size of the piece, the allowance increasing with the likelihood of the piece to distort.

■

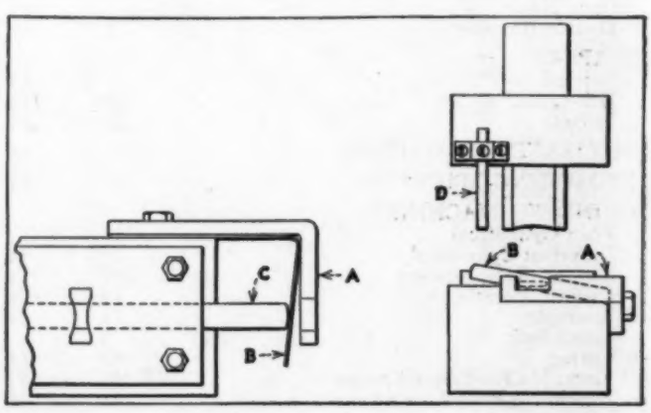
A Simple Automatic Stop

R. H. KASPER
Master Mechanic,
Steel Heddle Manufacturing Company

In constructing a set of press tools for cutting off a large quantity of short pieces of strip stock, the use of a locating pilot was impossible due to the absence of holes in the work. The arrangement shown in the illustration enabled the press operator to cut off the pieces at a fast speed.

Stop *A*, attached to the die, is provided with a groove slightly wider than the stock, and in line with it. The flat spring *B* is clamped between the stop and the die-block and is bent to slightly less than a right angle, so that the free end does not rest against the stop. The spring is also bent upward so as to cover the groove in the stop.

In operation, the incoming stock *C* contacts with the spring, pushing it against the stop, thereby arresting its movement until after the cutting operation has taken place. As the punch descends, pin *D*, carried in the



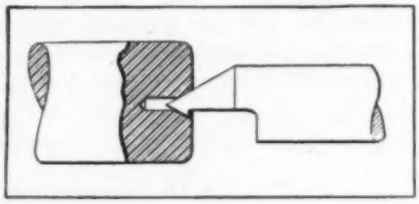
punch-holder, contacts with the outer end of the spring, pushing it downward so that the groove in the stop is unobstructed. The tendency of the spring to slip away from the stop, causes it to slip under the outer end of the piece just cut off. Since the stripper plate prevents the outer end of the piece from being raised by the spring, the spring cannot return to its original angular position until the piece has been pushed from under the stripper plate and into the groove in the stop by the oncoming stock.

■

A Three-Quarter Center for the Tailstock—*Discussion*

HENRY W. BOEHLY
Machine Designer,
Mergenthaler Linotype Company

In an article under the title given above, on page 446, Vol. 73, of the *American Machinist*, J. T. Towlson states that the three-quarter center described by him has all the advantages of a half center, and does not wear either itself or the work as fast as does the half center. While the statement may be correct in a general sense, its correctness depends upon the design of the half center.



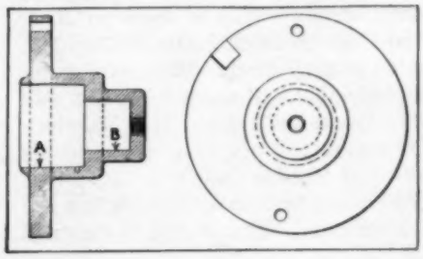
The half center illustrated herewith, being relieved as shown, is to all intents and purposes as good as a full center. It will not wear either itself or the work as fast as will the three-quarter center described by Mr. Towlson. Besides, it has the advantage of all the clearance for the tool that is offered by the ordinary half center.

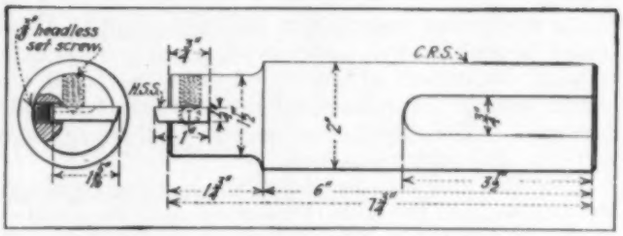
■

Boring Bar With an Adjustable Cutter

CHARLES C. TOMNEY
Tool Designer, Brunswick-Kroeschell Company

We were having trouble in reaming the shouldered holes in the cages of discharge valves used on compressors. A cage for a valve of one size is illustrated in Fig. 1. The bore *A* must be held to half a thousandth, and in addition it is necessary that it be straight, concentric with the bore *B*, and that the corner at the bottom must be sharp. While the bore *B* is finished by a reamer, we have not been very successful in reaming the bore *A*. The trouble was that the bottoming of the reamer caused the bore to be bell mouthed. To overcome this difficulty, we made the boring bar illustrated, and it has given excellent results.





The bar is held in the turret of a vertical boring machine in such position that the cutter is at a right angle to the plane of indexing. By this means, the size of the hole is not so subject to the errors of indexing as if the cutter were parallel with the plane of indexing. The outer end of the bar is turned down for chip clearance. A V-groove is milled slightly off center in the top of the cutter, so that the point of the holding screw will bear on one side. Thus, tightening the clamping screw will tend to force the cutter back against the adjusting screw.

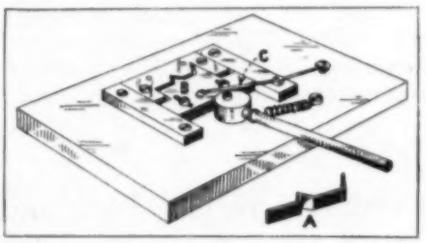
■

An Inexpensive Bending Fixture

CHARLES H. WILLEY
Assistant Plant Superintendent, Hoyt Electrical Works

When parts have to be made in small quantities, the ever-present problem is that of making simple and inexpensive tools for their production. Such devices are of interest on account of the ease by which they can be made and the good work they can do.

Such a tool is shown in the illustration. It is for bending the small part *A*, made of brass 0.031 in. in thickness. In operation, with the blank between the forming punch *B* and the die, the punch is brought against it by a lever - operated cam, bending it as shown. Upon releasing the lever, it and the cam are brought back to the starting position by a helical spring, the punch being caused to follow the cam by the spring *C*. Fillister-head screws passing through slots in the punch hold it down, yet allow its free movement toward and from the die. The side pieces, or guides, are pieces of cold-rolled steel.



■

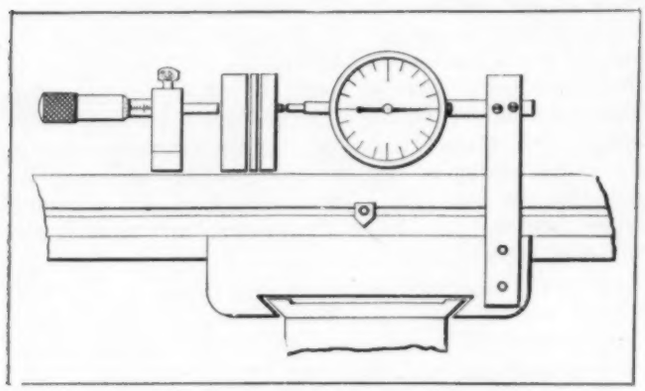
Precision Boring in the Milling Machine

CHARLES KUGLER

The best method I have ever seen of setting up for accurate boring in the milling machine is shown in the accompanying illustration. A dial gage is mounted on a strap attached to the saddle of the machine, the upper part of the strap being bent so that the center of the indicator spindle will be over the center of the front T-slot in the table. A micrometer head is mounted in

a movable block clamped in the front T-slot, the spindles of the micrometer and the dial gage being in line. Gage blocks having a total thickness equal to the distance between the centers of any two holes to be bored are placed between the spindles of the micrometer and the dial gage. The micrometer spindle is then adjusted until the dial gage reads zero.

After the first hole has been bored, the gage blocks are removed and the table is traversed until the spindles of the micrometer and the dial gage meet, and the dial



gage again reads zero. The table will then have been moved a distance equal to the total thickness of the gage blocks. With the table in this position, the second hole is bored. If other holes are to be bored in line the first two, other gage blocks of the required total thickness can be placed as before, and the dial gage brought to read zero by adjusting the micrometer spindle, without disturbing the position of the table. By proceeding as before, the table can be moved a distance equal to the center distance between the second hole and the next hole to be bored. The micrometer head serves only as an adjusting screw, and is used because it has a thread of very fine pitch. This method permits of great precision in hole spacing.

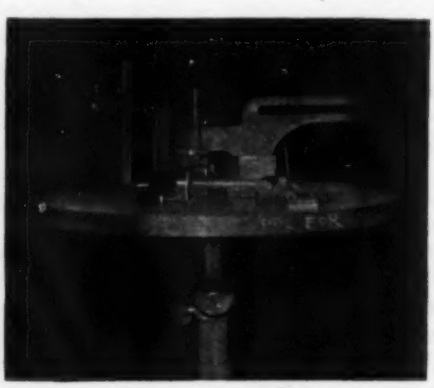
■

Combined Surface Plate and Work Table

A. P. GWIAZDOWSKI

Assistant Professor,
College of Engineering, University of Michigan

A cast-iron surface plate 30 in. in diameter, similar to that illustrated, will be found to be very handy. The table may be swiveled, raised, or lowered. If provided with casters, it may readily be moved to any part of the shop. It is large enough for two men to lay out work at the same time.



In the illustration the surface plate is shown in use to lay out a drill press bracket by employing a surface gage and a height vernier.

SEEN AND HEARD

●

Anti-Friction Bearings

PRACTICALLY speaking the ball bearing came in with the high bicycle in the early '80s, but not on the first bicycle or on all of them. I had one with plain bearings that seized once in awhile with disastrous results both to my physical comfort and dignity. The old roller bearing for grindstones came into being long before my recollection.

Enthusiasts predicted the early adoption of ball bearings to everything from baby carriages to locomotives. As usual, they were over-optimistic; but the use of ball and the newer types of roller bearings grew, aided and abetted largely by the automobile. Then came the ball and roller bearings on machine tools, finally reaching the spindles.

As a veritable climax, we now have the new Gray planer with 407 ball and roller bearings of seven different types. Could any dream be more completely fulfilled, even if it has taken fifty years to bring it about?

—*J.R.G*

A Demonstration

NOW THAT machine-tool manufacturers are building and putting out machines specifically designed for tungsten-carbide cutters, some of the real possibilities of this cutting alloy are being demonstrated. Recently a milling machine was announced by Kearney and Tucker in which rigidity of the head and table was featured, with speeds and feeds well above average. In a demonstration of the unit, with a 5-in. cutter rotating at 1,000 r.p.m. (1,300 ft. per min.), aluminum was machined at 40 in. per min. feed with $\frac{1}{8}$ in. depth of cut. With a smaller cut, the same piece was trimmed at the rapid traverse feed of 240 ft. per min. You would have thought the material was wood and the cutter a circular saw, so rapidly did the table slide past the spindle. Both the work and the cutter remained cool because of the light chip load at these higher speeds. The same machine cut cast iron at a feed of 21 in. and a cutter speed of 310 ft. per minute, leaving a finish that was well nigh perfect.

—*S.*

Forty Years of Prices

P. E. MONTANUS, retired president of the Springfield (Ohio) Machine Tool Company, tells a story on B. J. Shevlin, oil operator, now worth about $20,000,000. Mr. Shevlin came to Mr. Montanus in the '90's, explaining that he needed a 24-in. lathe, but had no cash. It was sold to him for $650, Mr. Montanus taking Mr. Shevlin's personal note for the amount. Since that time Shevlin has purchased a number of similar tools, the last 24-in. lathe costing him $3,750. His first order and his last are now framed in Mr. Montanus' office at the Springfield Works.

—*T.*

Heat-Treating Terminology

Tentative definitions especially as related to ferrous alloys

CONFUSION has existed for some time regarding the meaning of commonly used heat-treating terms. After careful consideration, it appears most logical and most in keeping with present-day usage to have the terms so defined that they shall mean definite operations and shall not be considered as referring to the resultant structures or general conditions. The definitions here shown are abstracted from the A.S.S.T. Handbook. By "critical temperature range," as used in the definitions, is meant that temperature range illustrated in Howe.

Definitions

HEAT TREATMENT—An operation, or combination of operations, involving the heating and cooling of a metal or an alloy in the solid state. (Heating and cooling for the sole purpose of mechanical working are excluded from the meaning of this definition.)

QUENCHING—Immersing to cool.

HARDENING—Heating and quenching certain iron-base alloys from a temperature either within or above the critical temperature range.

ANNEALING—Annealing is a heating and cooling operation of a material in the solid state. In annealing, the temperature of the operation and the rate of cooling depend upon the material being heat-treated and the purpose of the treatment. (Usually relatively slow cooling is implied.)

Certain specific heat-treatments coming under the comprehensive term "annealing" are:

A. *Full Annealing*—Heating iron-base alloys above the critical temperature range, holding above that range for a proper period of time, followed by slow cooling through the range. The annealing temperature is generally about 100 deg. F. (55 deg. C.) above the upper limit of the critical temperature range, and the time of holding is usually not less than one hour for each inch of section of the heaviest objects being treated. The objects being treated are ordinarily allowed to cool slowly in the furnace. They may, however, be removed from the furnace, and cooled in some medium which will prolong the time of cooling as compared to unrestricted cooling in the air.

B. *Process Annealing*—Heating iron-base alloys to a temperature below or close to the lower limit of the critical range followed by cooling as desired. This heat-treatment is commonly applied in the sheet and wire industries and the temperatures generally used are from 1,020 to 1,200 deg. F. (550 to 650 deg. C.).

C. *Normalizing* — Heating iron-base alloys above the critical temperature range, followed by cooling to below that range in still air at ordinary temperature.

D. *Patenting* — Heating iron-base alloys above the critical temperature range followed by cooling to below that range in molten lead maintained at a temperature of about 700 deg. F. (365 deg. C.). This treatment is usually applied in the wire industry, either as a finishing treatment or, especially in the case of eutectoid steel, as a treatment previous to further wire drawing. Its purpose is to produce a sorbitic structure.

E. *Spheroidizing*—Prolonged heating of iron-base alloys at a temperature in the neighborhood of, but generally slightly below, the critical temperature range, usually followed by relatively slow cooling.

F. *Tempering* (also termed *Drawing*)—Reheating, after hardening to some temperature below the critical temperature range, followed by any rate of cooling.

G. *Malleablizing*—Malleablizing is a type of annealing operation with slow cooling whereby combined carbon in white cast iron is transformed to temper carbon, and in some cases the carbon is entirely removed from the iron.

H. *Graphitizing*—Graphitizing is a type of annealing of cast iron whereby some or all of the combined carbon is transformed to free or uncombined carbon.

CARBURIZING (Cementation)—Adding carbon to iron-base alloys by heating the metal below its melting point in contact with carbonaceous material. ("Carbonizing" is an undesirable term.)

CASE HARDENING — Carburizing and subsequent hardening by suitable heat treatment, all or part of the surface portions of a piece of iron-base alloy.

CASE—That portion of a carburized iron-base alloy article in which the carbon content has been substantially increased.

CORE—That portion of a carburized iron-base alloy article in which the carbon content has not been substantially increased. (The terms "case" and "core" refer to both case hardening and curburizing.)

CYANIDING — Surface hardening of an iron-base alloy article or portion of it by heating at a suitable temperature in contact with a cyanide salt, followed by quenching.

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VOL. 74 NO. 5

Thanks to Lower Cost Dies

QUANTITY production methods have come to the forefront so prominently in recent years that the parts played by improved methods developed in toolrooms have been sometimes overlooked. It is a fact, nonetheless, that lowered toolroom costs have had much to do with making production faster and less expensive.

In stamping-dies, for example, automatic die-sinking machines and jig borers have effected great savings. Moreover, it is no longer necessary to make dies entirely of tool steel or to employ steel inserts to obviate wear. If a suitable alloy is selected, dies can be cast very nearly to the final shape and size required, thereby avoiding much of the costly machine work formerly required. Die life is much greater.

Dies for automobile body panels and fenders were once too costly to use except for bodies made in exceptionally large quantities. Changes in body lines were very expensive and infrequent. Today, thanks partly to less expensive dies, bodies cost much less and can be altered frequently to meet style changes that boost sales. Automobile manufacturers and many others owe a debt of gratitude to those who have reduced die costs.

Appropriations

IN LAST WEEK'S news appeared the following item: "Despite recommendations of the budget, the House appropriations committee has disapproved an item in the Commerce Department appropriation bill which would permit the machinery division to compile market information to assist the machinery industry in its sales in the United States."

Though the Department of Commerce will undoubtedly make effectual efforts to have the appropriation reinserted in the bill in the Senate, the Department should welcome any co-operation coming from machinery manufacturers themselves.

Fifty-Year-Old Tools in Railroad Shops

MACHINE equipment in railway shops has long been the subject of much controversy. Those responsible for the efficient repair of rolling stock desire the best machine equipment available. Those responsible for finances and dividends are frequently unable to see why machines that have kept locomotives and cars in operation in the past cannot continue to do so for a few years more. A railroad sells transportation, and its shops are perhaps comparable to the maintenance department of a large manufacturing plant.

Judging by statistics covering the past five years, reported by *Railway Mechanical Engineer,* the life of machine equipment has been stretched more than railroad managers probably realize. Machine tools in use, as compared with purchases from 1926 to 1930 inclusive, indicate an average life of approximately fifty years, much older than in any other of our great industries that have come under our observation. These figures are in accord with those of *American Machinist's* 1930 obsolescence survey, which shows seventy-three per cent of railroad equipment to be more than ten years old.

Since 1926 the railroads have purchased, in round numbers, 16,700 machine tools, divided as follows over the five years: 4,000, 2,500, 2,600, 4,900, and dropping to 2,700 in 1930. On the basis of 1929 purchases equipment would be expected to last thirty-three years; fifty-seven years on those of 1930; and over sixty years on the bases of 1927 and 1928

These are rather startling figures, for though railroads as a class do very little manufacturing on a large scale in their shops, their earnings are seriously affected by delays in getting locomotives back into service, and machines from thirty to sixty years old can hardly be efficient in any kind of work.

It is not to be expected that railroad shop equipment be replaced on the same basis as that of manufacturing plants. But if such machines are kept in use for an average of fifty years it is obviously unfair to ask that they pay for themselves in two years, as is frequently the case. According to the figures given, the saving could be spread over a twenty-year period and still justify the purchase of a new machine.

SHOP EQUIPMENT NEWS

Keller Types G-1210 and GG-1210 Automatic Die-Making Machines

Die and tool work up to 12x10 in. can be done on the two small automatic toolroom die-making machines announced by the Keller Mechanical Engineering Corporation, 70 Washington St., Brooklyn, N. Y. These machines are known as the Types G-1210 and GG-1210, the second machine being supplied with a built-in jig-boring device. Both machines are designed for rapid, accurate, and economical production of trimming, blanking, piercing, extrusion, and progressive dies, and also molds, cams, punches, and other odd-shaped work that can be milled from templets. These machines employ the same principles of operation as used on the larger Type BL announced on p. 489, Vol. 63, of *American Machinist*. They operate with equal sensitivity, and possess a wide range of spindle speeds from 225 to 3,500 r.p.m., and to 10,000 r.p.m. with the Keller high-speed spindle.

Although both machines are sturdy enough to withstand heavy hogging cuts, they are also sensitive enough to use mills as small as 0.044 in. in diameter. The cutter spindle is guided by a simple electrical control from the tracer following the contour of a templet. Aside from occasional manual manipulation of the tracer control ring to give the machine its directional bias, all contouring is automatic. The machines are fixtured to permit quick and accurate turning over of the templet and the job, necessary in relieving dies from the back. Flanged punches can also be cut.

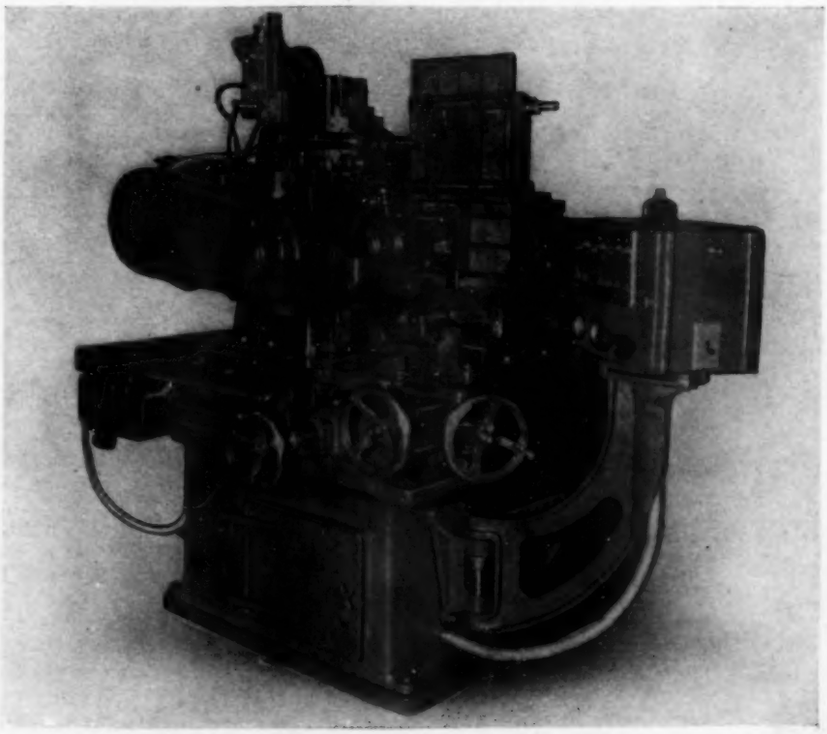


Fig. 1—Keller Type GG-1210 Automatic Die-Making Machine equipped with a jig boring feature and having capacity for work up to 12x10 in.

The column of either machine slides on a horizontal bed and carries the vertical slide for the up and down movement of the cutter head. In addition to automatic control, the vertical and horizontal motions can be operated by hand by means of switches or handwheels. Transverse movement of the work table is operated by a handwheel, and in the Type GG machine there is a power transverse feed for jig boring, together with built-in vernier scales, magnifier, and reading lights. A 1½-hp. d.c. motor drives the standard cutter spindle by means of a V-belt and four step pulleys, giving four speeds through open belts and four through backgears, which are engaged or disengaged by means of a single lever. A constant stream of cutting fluid is maintained by a motor-driven pump.

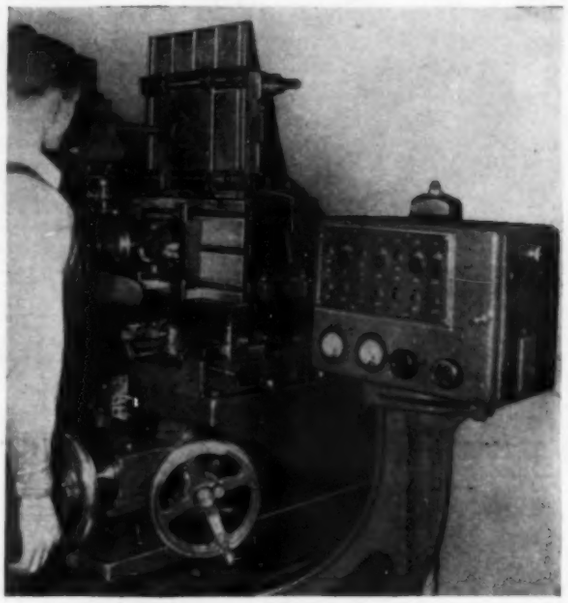


Fig. 2—Close-up of the control cabinet mounted on the swinging arm, and also showing the tracer and cutter spindles

Specifications of the Type G-1210 machine (without jig boring feature) are: horizontal travel, 12 in.; vertical travel, 10 in.; transverse adjustment, 8 in.; table working surface, 18x18 in.; distance between spindle and tracer centers, 13 to 16 in.; distance from work-table to spindle center, 0 to 10 in.; spindle bored for No. 9 B. & S. shank; base measurements, 45x46 in.; weight, 5,000 lb.; normal

speed range, ¾ to 1½ in. per min. An automatic intermittent feed through a commutator is provided to slow down the normal feeds, permitting the use of very small mills.

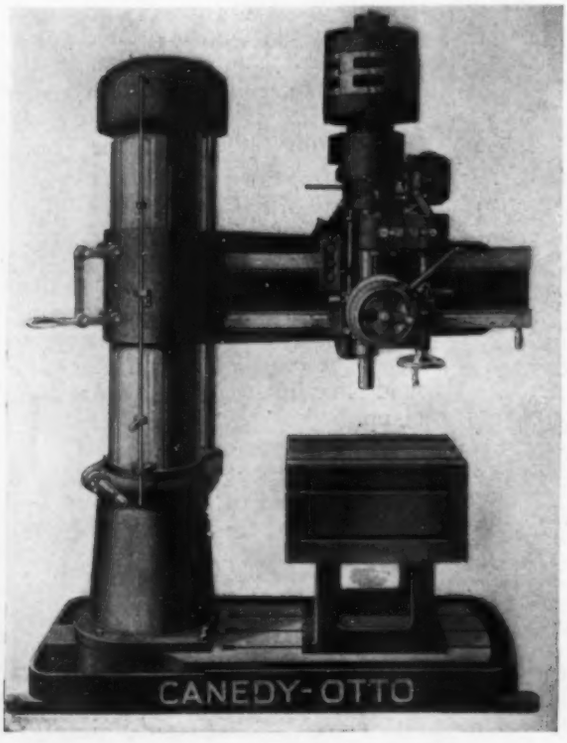
Dial readings can be made to 0.002 in. on all three handwheels, and the tracer bracket is provided with screw adjustments vertically and transversely with dial readings to 0.001 in. One contour tracer is supplied, together with an assortment of mills and tracers, and collets for Nos. 7 and 5 B. & S. shanks. Special equipment includes a two-part, angle-plate fixture with an upper section, adjustable transversely and carrying a faceplate with horizontal screw adjustment, the dial reading to 0.001 in. The equipment includes a templet holding brackets and clamps, together with a bolster with die supporting the key and clamp bolts. The high speed spindle unit runs at 5,000 to 10,000 r.p.m.

The Type GG-1210 machine (with the jig boring feature) is the same in all respects as the Type G machine, but in addition, it is equipped with accurate vernier scales mounted at the front of the machine for both the vertical and horizontal motions. The maximum height is 82 in., and the depth over-all is 60 in. Otherwise the specifications of the Type G machine apply.

Canedy-Otto 3-Ft. Radial Drill

Direct drive at high speed from a four-speed induction motor mounted on the head is the chief feature of the "C-O" 3-ft. radial drill offered by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. A backgear with simple lever control furnishes four additional spindle speeds. Motor speeds are selected by a drum controller mounted directly on the head. Another convenience is a push-button control with forward, stop, and reverse stations. The motor is ball-bearing mounted and is of the semi-enclosed type. Timken tapered roller bearings support the spindle in the quill.

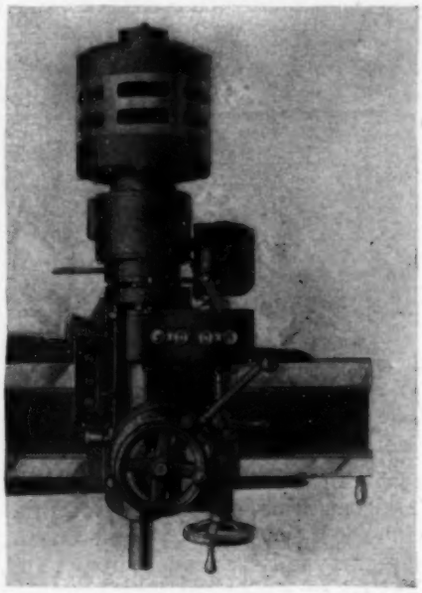
Four feeds are provided through a train of heat-treated alloy steel gears. Two control levers on the front of the feed gearbox allow the operator to select the feed rate while the spindle is in motion. For slow hand feed operation, a ratchet feed clutch is tripped by a hand lever. For rapid hand feed operation to depth by rack and pinion, a long handled arm is used in conjunction with a dial gage.



Concentric with this dial gage is a handwheel for traversing the head saddle along the arm, 3½ in. for each revolution of the handwheel. To facilitate this motion, the saddle is supported on a row of steel balls which contact with a hardened steel member fastened to the top guide of the arm. Gib adjustment is on the lower V-guide.

Vertical movement of the arm on the column is by a separate ½-hp. ball - bearing electric motor. Locking of the arm on the column is by a set of compression screws linked to a single lever.

A single cam lock lever clamps the column to the base. Thrust is taken on a large tapered roller bearing in the column, and radial stabilization is supplied by an annular ball bearing located half way up the column.



Details of the head of the "C-O" 3-Ft. Radial

Specifications

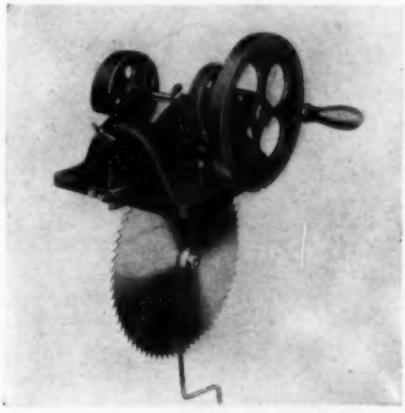
Diam. of drill circle, in.	72
Diam. of column, in.	10½
Distance of spindle base, max., in.	50
Distance of spindle to base, min., in.	11
Distance of spindle to column, min., in.	11
Traverse of spindle, in.	10
Hole in spindle, Morse taper	No. 4
Traverse of head on arm, in.	27
Traverse of arm on column, in.	30
Spindle speeds, r.p.m.	85-1,750
Feeds per rev. of spindle, in.	0.02-0.004
Extreme height of drill, in.	112
Working surface of base, in.	28x37½
Surface of box table, in.	22x20
Height of box table, in.	24
Floor space for full arm sweep, in.	98x63
Net weight, lb.	3,000

Carpenter Automatic Saw Setter

Hand, band, and circular saws can be set automatically on the saw setting machine developed by Carpenter Tool Company, Barrington, R. I. It is practical for all carpenters' hand saws having three points per inch

and all smaller teeth. Band saws up to 2 in. in width and having three points per in. and smaller teeth can be handled, and all circular saws up to 20 in. in diam. and having three points per in. and smaller teeth can be set. Maximum circular saw thickness is No. 14 gage.

The principle of operation is the striking of hammers against anvils. The anvils are opposite each other and the space between them for passage of the saw is adjustable to take the thinnest blade of a bandsaw to a No. 14 gage circular saw. Two hammers are actuated by one coil spring, which insures a blow of uniform force by both hammers at all times. The expansion of this spring



Carpenter Automatic Saw Setter

is accomplished by two twin cams set with "trips" 180 deg. from each other, thus striking alternate blows and giving a uniform load on the drive wheel at all times. The tension of this spring is adjustable to deliver blows of adjustable force. Rotation of the drive wheel sets in motion all working parts of the machine. Circular saws are secured to the machine by the regulation "cone arbor" to accommodate saws having different sizes of holes.

Sheffield Electric Gage

Accurate readings to 0.00001 in. can be made with the electric gage announced by the Sheffield Machine & Tool Company, Dayton, Ohio. This gage has no wearing parts, except the anvils, to lose this accuracy and does not depend upon human judgment or sense of touch.

Faster gaging is obtained because the operator does not have to hesitate to make readings. The signals flash instantly. Normally the coil spring holds the movable block down and the indicating lever rests against the left-hand contact, causing the green light (undersize) to go on. This light will continue to show if the work placed

Fig. 1—Sheffield Electric Gage, which has accuracy to 0.00001 in., and which flashes a green light for undersize, an amber light for correct size, and a red light for oversize

on the anvil is undersize. Should the work be correct, the lever will be moved to vertical, the green light going out and the center, or amber light, flashing on. Should the work be oversize, the lever moves to the right and the red light flashes. The current potential used is 18 volts, and a transformer similar to those used on electrical toys is provided to step down the shop voltage.

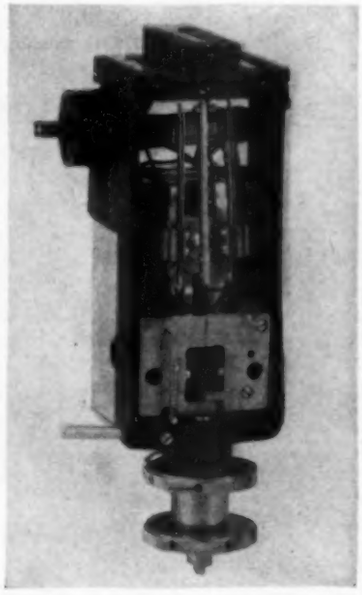


Fig. 2—The contact points can be adjusted from 0.00002 in. to 0.002 in. tolerance

The indicating lever, as shown in Fig. 2, travels between two adjustable contact points, which are adjustable from 0.00002 in. to 0.002 in. tolerance, by means of the "scissors" seen at the back of the frame. Motion to the indicating lever is transmitted by parallel spring-steel reeds to which it is attached. These reeds are in turn attached to two blocks, the right-hand one being secured to the frame while the left-hand block is merely tied to the rigid block by two other spring-steel reeds. The movable block is held down against the plunger of the upper anvil by a fine coil-spring, and when work is placed under the anvil the block is forced upward, thus distorting the reeds which support the indicating lever and causing the lever to move from side to side. A small extension of the right-hand block over the lower part of the left-hand block acts as a safety stop and prevents damage to the gaging mechanism, should the head be dropped on the column.

"J & H" Swivel-Taper Magnetic Chuck

To facilitate the grinding of bevels and tapers and for general toolroom work, the J. & H. Electric Company, Inc., 200 Richmond St., Providence, R. I., has developed a combination swivel-taper magnetic chuck, now available in the smaller sizes, 5x13

Fig. 1—"J & H" Swivel-Taper Magnetic Chuck set for grinding bevels

and 7x16 in. All adjustments are quickly and easily made. Essential parts are a base, cradle, and trunnioned magnetic chuck. The base clamps to the machine and carries the pivoted cradle and the elevating

screws, indicator plates, and pointers for taper grinding.

For grinding bevels the cradle is locked in the zero position, and the chuck is swiveled to the desired angle, indicated by a ring with two-degree graduations. Maximum bevel is 45 deg. from horizontal in either direction. For grinding tapers the chuck is locked in the zero position and the cradle raised by means of elevating screws, until the indicator registers the desired taper. This indicator is graduated in steps of $\frac{1}{8}$ in. per foot to a maximum taper of 1 in. per foot.

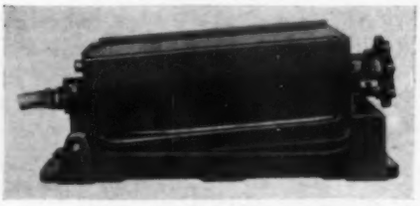


Fig. 2—"J & H" Swivel-Taper Magnetic Chuck set for taper grinding

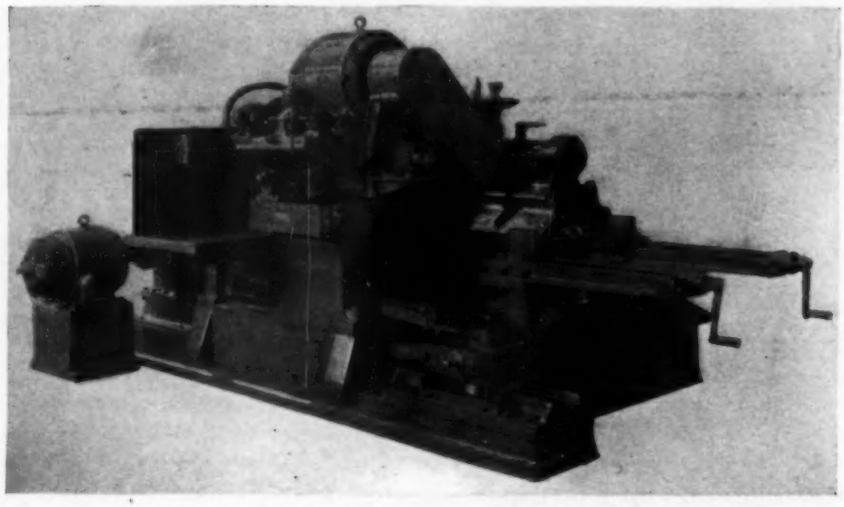
This combination magnetic chuck is supplied complete with adjustable back and end stops, 6 ft. of cord, and a demagnetizing switch.

Farrel Roll Grinder

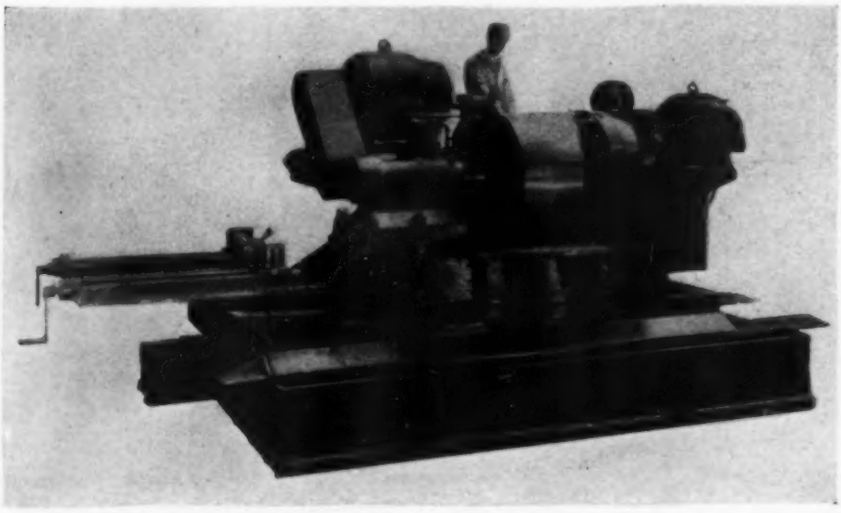
Vertical rolls for universal structural-beam mills can be ground on the roll grinder announced by the Farrel-Birmingham Company, Ansonia, Conn. These rolls are 42 in. in diameter by 18-in. face, and they have a surface with a combination taper and curve. The middle portion of the face is ground with a true radius and the sides with a straight taper, usually either 4 or 8 deg. These machines are capable of grinding rolls with a maximum taper on the face of 12 deg., and it is also possible to grind straight-faced rolls.

The swivel table is mounted on the carriage and is provided with a hardened steel ball race. It is reinforced with a broad rib between the bearing surfaces of the headstock and the tailstock as an aid in stiffening. The pivot pin is equipped with a Timken bearing having a lubricating pad. Inverted V-ways support the carriage on which the swivel table is mounted.

A long lever extension on the swivel table carries an adjustable nut that may be traversed for a distance of 3 ft. This nut has a lever extending to another arm equipped with a similar nut adjustable for the same distance. The second arm forms one arm of a bell crank, while the other arm of the bell crank is connected through links to a nut moving on a screw parallel to the axis of the roll. The bell crank itself is mounted on the carriage, and the arm that is connected through the linkage to the nut on the screw is equipped with a roller



Rear view of the Farrel-Birmingham Roll Grinder, showing the tapering and swiveling mechanism for tapers up to 12 deg.



Front view of the Farrel-Birmingham Roll Grinder for vertical rolls of universal structural-beam mills. Such rolls are 48 in. in diameter by 18 in. face and have a combination tapered and curved surface

which travels along a slot parallel to the axis of the roll. These parts constitute the carriage traverse and work swivel mechanisms.

In operation, the nut for traversing the carriage moves along on the screw connected by linkage with the bell crank. The roller in the slot prevents the bell crank from rotating so that the whole carriage, including the swivel table, moves in parallel to the axis of the roll, until the roller comes to the opening in the wall of the slot. Because the resistance of the whole carriage moving on the ways is greater than the resistance of the swivel table in rotation, when the roller comes to the slot opening, the whole carriage stops moving and the bell crank swivels until the roller comes in contact with the opposite wall of the slot,

where further rotation of the swivel table is prevented, and the whole carriage moves forward again. Movement of the bell crank rotates the swivel table through the linkage connecting the arm of the bell crank to the arm of the swivel table. The angle through which the swivel table moves is adjusted by moving the nuts in the swivel table arm and the bell crank arm away from or toward the center of rotation.

Carriage traverse is accomplished by means of a single worm-gear reduction, in connection with the traverse screw and crosshead which contains the nut connected to the bell crank arm by the linkage referred to above. This mechanism is driven by a d.c., variable-speed, reversing motor.

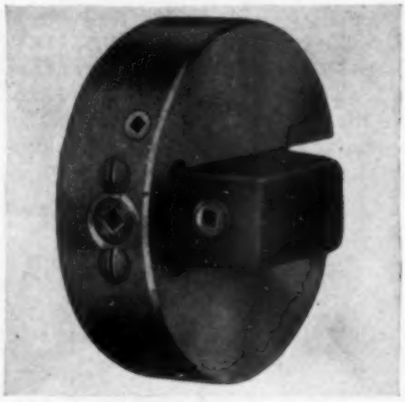
The headstock is of the dead-center type, the faceplate being driven by means of a pair of double helical gears and a worm-gear reduction. The tailstock is provided with a sidewise adjustment and is equipped with a roll face indicator to locate the roll central with the carriage pivot.

A 30-in. grinding wheel is employed. It has a 3-in. face and is mounted on a heavy spindle of the Farrel standard type, with a lubricating system independent of all other lubricating systems on the machine. The grinding wheel unit is provided with a hand feed and a motor-operated feed. Drive from the motor to the wheel spindle is by means of multiple V-belts at speeds from 575 to 1,150 r.p.m.

Each unit is separately driven by a d.c. motor, and variable-speed control is provided for the grinding wheel, headstock, and traverse motors to provide the proper combination of work speeds for these units.

Flynn No. 18 Micrometer Offset Boring Head

For metal pattern work or any machine work where a large offset is necessary, J. M. Waterson, 427 Woodward Ave., Detroit, Mich., has introduced the No. 18 Flynn micrometer boring head having capacity for offsets up to 3 in., and for bores up to 6 in. in diameter. The dial is graduated in thousandths for accurate adjustment in boring, fifty thousandths being equivalent to one turn



Flynn No. 18 Micrometer Offset Boring Head having an offset of 3 in.

of the micrometer adjusting screw. The height of the boring head is $1\frac{3}{4}$ in., the bar capacity $\frac{1}{16}$ in., the diameter 6 in., and the weight 12 lb. This head can be used with shanks or can be fitted to machines having threaded spindles by threading the back plate to suit.

Rivett Series 505 Ball-Bearing Headstock Lathe

Tungsten-carbide tools can be employed with the ball-bearing headstock lathe announced by the Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass. This Series 505 bench lathe has front spindle bearings of the double preloaded type. The rear spindle bearing is a single-row type and is mounted to take care of expansion and contraction of spindle from heating and cooling. The headstock is equipped with Forkups controlled feed lubricators manufactured by the company, and the bearings are protected against entrance of foreign matter. The spindle assembly is dynamically balanced.

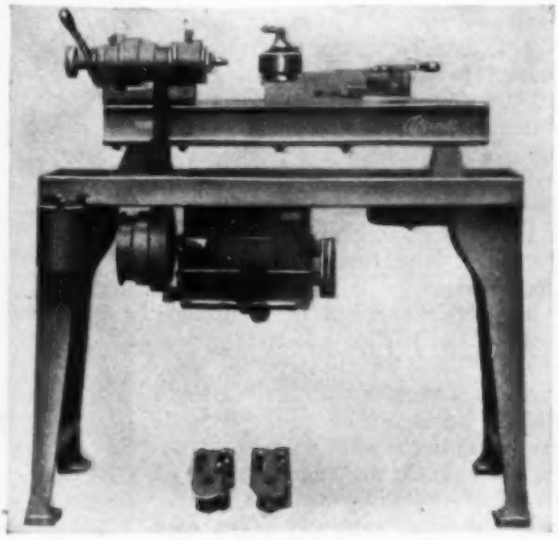
Maximum working speed of 4,600 r.p.m. has been embodied to make use of tungsten-carbide tools. With spindle revolutions of 4,600 r.p.m. $\frac{1}{16}$-in. mild steel work can be turned at 82 ft. per min., and 1 in. work at 1,310 ft. per min. The machine has a drum-type reversing switch and pedal control.

Taft-Peirce Flat Plug and Shoulder Snap Gages

Two types of gages have just been announced by The Taft-Peirce Manufacturing Company, Woonsocket, R. I. The first is an adjustable flat plug gage for measuring large internal diameters, and the second is an adjustable snap gage for checking shoulder work. The flat plug gage consists of a balanced body shaped to fit the hand. By an eccentric

Fig. 1—Taft-Peirce Adjustable Flat Plug Gage for measuring large internal diameters

adjustment, the gaging members are expanded, locked, and then can be reground to the original size. They are made from hard steel and the



Rivett Series 505 Ball-Bearing Headstock Lathe suitable for spindle speeds up to 4,600 r.p.m. with tungsten-carbide tools. A turret is shown mounted on the machine

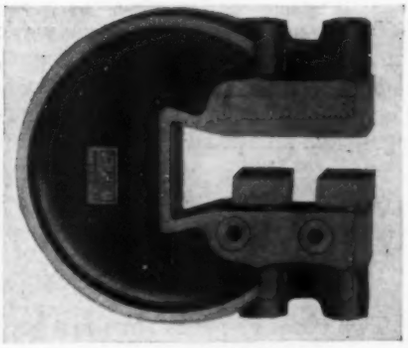


Fig. 2 — Taft-Peirce Adjustable Snap Gage

interchangeable members can be replaced. Expansion of $\frac{1}{8}$ in. is provided to allow a number of regrindings.

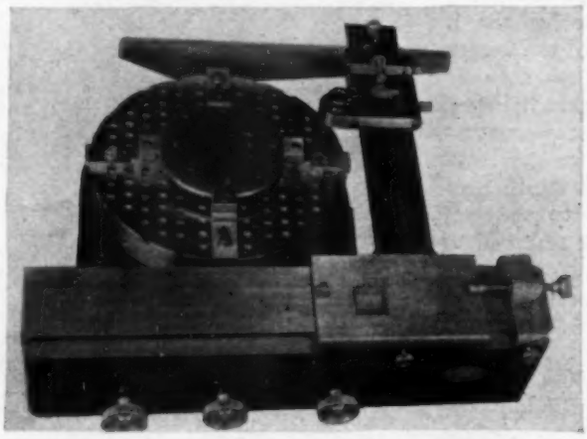
The adjustable snap gage is designed for checking flat or cylindrical work of plain sections or shoulder work up to a sharp corner. The adjustable member has two square anvils that can be set to any desired limits within its range. A clamping device locks the anvils securely. The stationary member is bolted rigidly to the frame.

Moore Precision Lay-Out and Drilling Table

Accurate drilling and spacing of holes in such parts as masterplates, templets, and flat jigs can be done on the precision lay-out and drilling table announced by the Moore Special Tool Company, Inc., 538 John St., Bridgeport, Conn. Holes can be drilled and reamed to limits of plus or minus 0.00025 in., and the time per hole varies from 2 to 5 min., according to the size of the hole and thickness of the work. The equipment has capacity for work 1 in. thick x 8 in. wide x 10 in. long, and up to 8-in. round plates. It is particularly suitable for clock makers.

The table consists of a bushing mounted on a slide which is graduated in 40ths of an inch, the slide carrying a vernier plate. This small slide is mounted on a larger slide graduated in the same manner. Readings are made for the distance of travel of the slides as on a vernier height gage or caliper. When each slide is set to read 4 in., the upper bushing is exactly in line with the axis of the rotary table.

The work-holding table is an 8-in. disk and can be turned and set at 90 deg. positions or at any angle. Angles can be read to one minute of arc. Three large knobs are located on the front of the equipment for operating the rotary table. The knob at the right operates a plunger to



Moore Precision Lay-Out and Drilling Table, suitable for clock makers' work up to 1-in. thick, 8-in. wide and 10-in. long

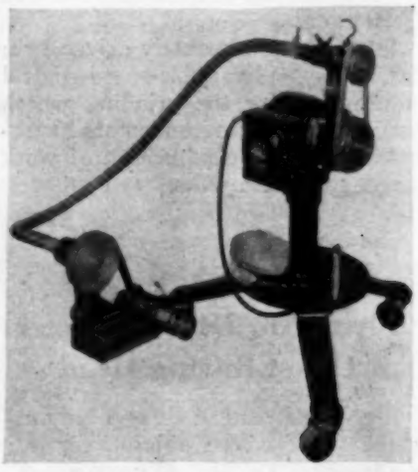
locate the table at any right angle. The center knob is a micrometer adjustment for setting table on exact angles, and the left-hand knob is for clamping the table after setting it in position. Lines can be scratched and prick punches located accurately on the work. The slots in the table are milled parallel and spaced in even inches to facilitate quick set-ups. A $\frac{1}{4}$-in. thick templet can be held on clamps with lips, or thicker work can be put on parallels between the clamps.

Equipment furnished with each machine consists of two sets of clamps, one for holding round templets and one for square work, three standard bushings, and three single-lip reamers for finishing the holes to size, and locating screws. A wooden cabinet is furnished for the instrument and another is provided for the accessories.

Haskins Type HL-7 Heavy-Duty Toolpost Grinder

A heavier toolpost grinder has been placed on the market by the R. G. Haskins Company, 4630 West Fulton St., Chicago, Ill., known as the type HL-7. This model employs a wheel of 8 in. in diameter by 1-in. face and the speed can be varied by means of a multi-speed countershaft. The unit is small enough so that it can be set to grind in all positions; that is, with the toolpost in back of the work, in front of the work, or at right angles to the work. Drive for internal grinding is accomplished by a multiple V-type belt, and it is a simple matter to change over to grinding external work. The grinder has a ball bearing drive.

The external spindle is so designed that different quills can be applied for grinding deep holes. Quills range from 7 to 19 in. in length. The grinder is also supplied with an extension spindle for grinding holes from 2 to 3 in. in diameter. For internal work, power is supplied to the spindle by three V-belts and four speeds are obtainable, the slowest being 2,250 r.p.m. for 8-in. wheels and the highest 9,300 r.p.m. A $1\frac{1}{2}$-hp. motor is regularly supplied. The grinder is also suitable for use on planers and shapers for surface grinding. Since the internal and external attachments are independent units, the machine can be furnished for either



Haskins Type HL-7 Heavy-Duty Toolpost Grinder, which will carry an 8x1-in. wheel

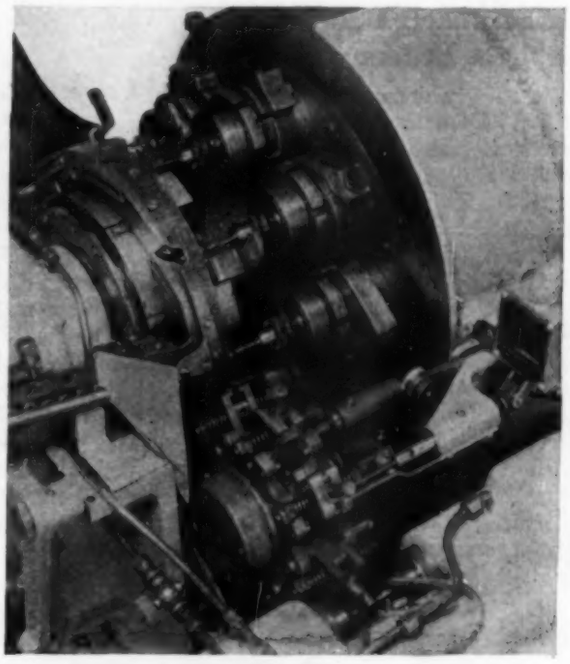
type of work only. A $1\frac{1}{2}$-hp. motor is supplied for either single- or three-phase circuits. An extra-heavy pedestal base is also a feature.

Fitchburg Horizontal Continuous Drilling Machine

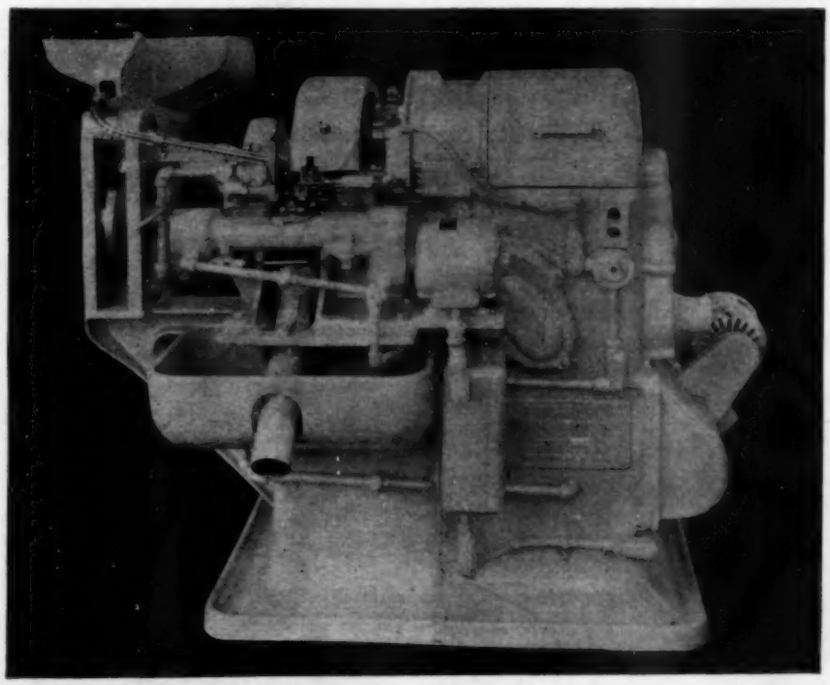
Cotter-pin holes in clevis pins, spring bolts, and the like can be handled on the horizontal continuous drilling machine announced by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass. The work is hopper fed to the magazine, which leads the pieces to the automatic clamping fixtures. The holes are drilled and countersunk, if necessary, and then ejected. The maximum length of the work that can be handled is 3 in., with the hole not over $\frac{1}{2}$ in. from the end, and the maximum diameter of the work is $\frac{5}{8}$ in. The maximum size of the drill that can be used is $\frac{1}{4}$ in., and the depth of hole $\frac{5}{8}$ in. On a clevis pin, connecting rod bolt, or steering rod ball, 60 pieces per min. have been drilled and countersunk.

Parts of the same diameter but of different lengths can be drilled with very little change in tooling and fixtures. For other parts new fixtures and loading devices would be required. In equipping for a number of different jobs, the in-feed cam of the drill spindles is set for the maximum thickness of the work to be drilled, and thus the cam can be employed for all work done and need not be changed.

In the machine described there are eight ball-bearing drill spindles set horizontally in a rotating drum. The drum is driven by a worm and gear, and around it there is a stationary ring cam, which feeds in the drill spindles as the drum rotates. The spindles are driven by a center gear on the main drive shaft and engage with pinions on the spindle shafts. Spindle sleeves are slideable horizontally. The drill speeds can be changed by pick-off gears at the end of the machine. Fixtures are clamped on a turret which is mounted on the drum shaft, all of which rotate in alignment with the drill spindles. These fixtures clamp automatically by means of a stationary cam.



Close-up of fixture, drum and unloading turret, showing the limit switch in the foreground and the testing needle



Fitchburg Horizontal Continuous Drilling Machine for such parts as clevis pins and spring bolts. Maximum length of work, 3 in., hole not over $\frac{1}{2}$ in. from the end; maximum diameter of work, $\frac{5}{8}$ in.; drill size, $\frac{1}{4}$ in., and maximum depth of hole, $\frac{5}{8}$ in.

A countersinking attachment is placed in the front of the unloading turret, and will countersink both ends of a hole by means of two opposed spindles operated by levers at each indexing of the turret. The attachment is adjustable to and from the turret for different lengths of work. The throw of the countersinking spindles can be adjusted for varying diameters of the work. This attachment is removable.

An automatic electrical stop placed above the unloading turret tests each drilled hole as the piece indexes by. This is done by means of a needle which passes through the hole. If the hole is not drilled through, the needle is stopped and the limit switch operates to stop the motors.

Coolant is pumped by a separate motor through the end of the drum shaft and into the fixture turret. It is lead directly onto the drills as the entire mechanism rotates. The machine is automatically lubricated from a tank of oil in the base. The drum

and spindle drive gears are flooded with oil by a spray pipe from the top. This oil floods all of the mechanism on its way back to the tank.

Baumbach Demountable Leader Pin

A quickly demountable leader pin with a locking device is now employed in its die sets by the E. A. Baumbach Manufacturing Company, 1812-1818 So. Kilbourn Ave., Chicago, Ill. This leader pin, illustrated in Fig. 1, is for use with leader pin die sets, and is designed to lock leader pins positively in the die shoe, and offers quick dismounting. It consists of a leader pin fitted with three studs, a pressure spring to retain the studs, and a hollow-head, cone-point locking screw. By turning the locking screw with a socket wrench, the pressure spring is expanded into a recess in the die shoe, as illustrated in Fig. 2. By reversing the operation, the pin is again loosened, providing easy removal of the leader pin. The number of times the leader pins are removed from the die shoe does not affect the positive locking and alignment obtained.

Fig. 1—Cut-away view of Baumbach Quick Demountable Leader Pin

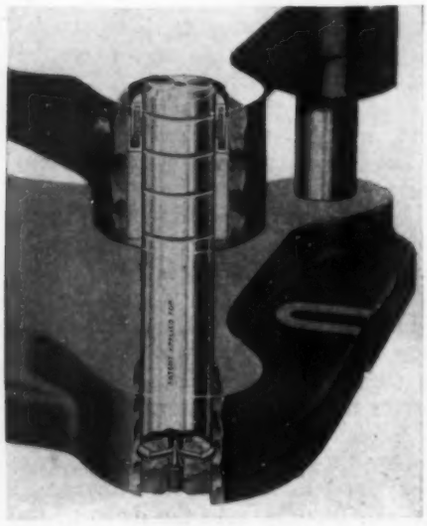


Fig. 2—Sectional view of Baumbach die set equipped with a quick demountable leader pin and automatic oiler

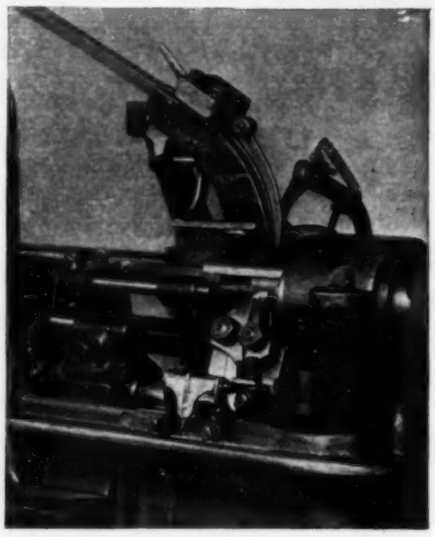
Cook Woodscrew Machine Attachment

Many manufacturers have experienced trouble in machining corrosion-resistant steels, especially the 18-chromium, 8-nickel variety. One of the greatest difficulties lies in threading these materials.

The Asa S. Cook Company, Hartford, Conn., has developed an attachment to its line of woodscrew pointing and threading machines. The attachment is made in three models designed to fit the Nos. 1, 2, and 3 machines, respectively, which will thread all the common sizes of woodscrews. Through its use, stainless-steel screws may be turned out on a commercial basis. This cannot be done satisfactorily with former methods of tooling.

The essential feature of this attachment is its use of two threading tools, instead of the usual one. The tools operate simultaneously on adjacent thread grooves and are so positioned that each removes about half the metal formerly cut by one tool. The first of the tools removes the metal on the head side of the thread and the second that on the point side. This arrangement splits the chips, allowing the free cutting action required for this type of steel. A slight overlap is provided to remove the fin.

The toolholders are of bronze and are mounted on a horizontal shaft, one being recessed into the other to obtain maximum rigidity. The first tool is clamped to the shaft and is actuated by the regular forming cam. The second toolholder has a running fit on the shaft and is actuated by a special former mounted on a yoke at the front of the machine. A bronze collar keeps this toolholder in position. The regular lead cam is used to feed both tools.



The woodscrew machines are ordinarily driven in groups. The use of the attachment increases power consumption only slightly, a 7½-hp. motor being required for a battery of 30 machines. When the attachment is in use, eight 1½-10 woodscrews can be threaded and pointed per minute.

Biax Portable, Flexible-Shaft Shear

Power for cutting heavy sheet metal, combined with light weight and portability, are the features of the flexible-shaft shear announced by the Biax Flexible Shaft Company,

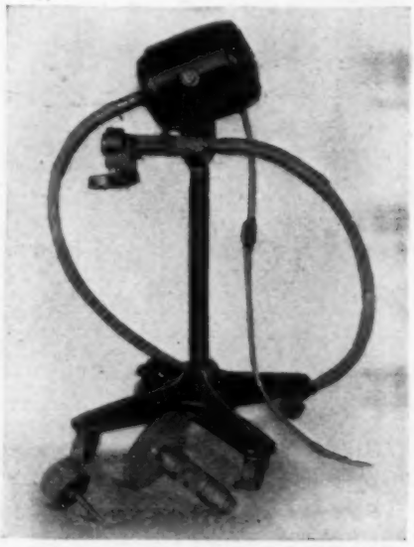


Fig. 1—Biax Type 811 roller floor-type shear

Inc., 22-14 Fortieth Ave., Long Island City., N. Y. This shear is capable of shearing up to 16-gage Allegheny and monel metal, 14-gage sheet iron, and 12-gage brass and aluminum. The shear handpiece, illustrated in Fig. 2, is known as the type S, and is ball bearing equipped throughout. It has a one-piece housing of small dimensions. Cutting jaws are of special steel, and are interchangeable. This handpiece may be used on the Supra Biax units.

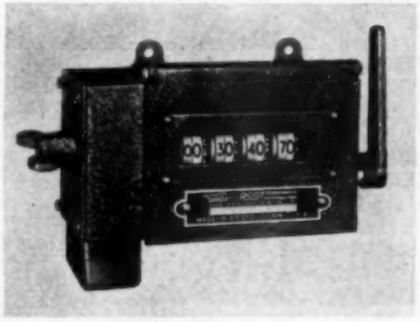
This portable shear can be furnished in a portable floor-stand type or roller floor type known as the 811 and equipped with a ½-hp. motor running at 3,600 r.p.m. The equipment can also be used for grinding and sanding. The type 851 is an overhead suspension-type utilizing a portable trolley. The type 871 is a stationary shear resembling a bench-type grinder, being fitted with the shear at one end of the spindle and the grinding wheel at the other. It employs a ¼-hp. motor.

Fig. 2 — Close-up of the Biax Shear Handpiece, showing that intricate shapes can be cut

Veeder-Root Predetermining Counter

A Root type predetermining counter, which can be set to any desired number within its capacity and will, when that number is reached, make or break contact in an electric contactor which is part of the counter, has been placed on the market by Veeder-Root, Inc., Hartford, Conn. The electrical circuit may be used to light a light, ring a bell, or stop the machine upon which the counter is installed.

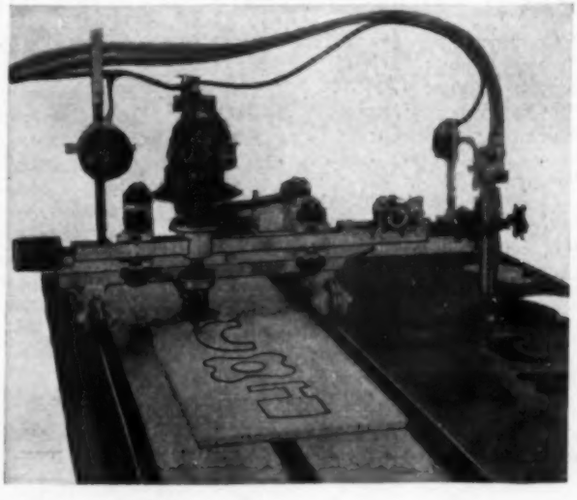
The counter itself has two distinct sets of figure wheels, one set having large black figures on white wheels (the counting wheels), the other, small black figures on metal wheels (the predetermining wheels). The metal wheels are set manually to the desired number. Upon operation of the counter, the counting wheels advance, the predetermining wheels subtract, and when the counting wheels reach the number which was predetermined on the metal wheels the electric contactor operates. To set the counting wheels to zero, it is only necessary to pull out the wing nut and turn it once.



Veeder-Root Predetermining Counter for indicating or stopping a machine after a specified batch has been run through

"Geweco" Type K-O Portable Shape-Cutting Machine

A portable automatic shape cutter has been placed on the market by the General Welding & Equipment Company, 70 Lansdowne St., Boston, Mass. Because of its design, this machine can be employed for exceptionally large jobs, where a fixed machine of large capacity could not be afforded, and it is also suitable for small-quantity production of narrow pieces. It therefore fits the requirements of jobbing shops and others where the demand is varied, but the output is not large. The capacity of the machine is from 1 to 2 ft. wide by any length. It runs on a track.



PATENTS

JANUARY 13, 1931

Metal-Working Machinery

Indexing Mechanism for Automatic Multiple-Spindle Screw Machines. Alfred E. Drissner, Cleveland, Ohio, and Charles Q. Garey, Windsor, Vt., assigned to The National Acme Co. *Patents 1,788,422 and 1,788,423.*

Feed Mechanism for Grinding Machines. Charles E. Van Norman, Springfield, Mass., assigned to Van Norman Machine Tool Co. *Patent 1,788,475.*

Machine for Rolling Metallic Disks. John W. Smith, Philadelphia, Pa., assigned to Budd Wheel Co. *Patent 1,788,550.*

Machine for Rolling Tapered Disks. John W. Smith, Philadelphia, Pa., assigned to Budd Wheel Co. *Patent 1,788,551.*

Assembling Machine. Charles J. Spill, Garden City, N. Y., assigned to A. Schrader's Sons, Inc. *Patent 1,788,601.*

Machine-Tool Drive. Hans Ernst, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co. *Patent 1,788,761.*

Machine for Manufacturing Heat Radiating Elements. William Joseph Still, London, England. *Patent 1,788,895.*

Power Traverse for Radial Drill Heads. David C. Klausmeyer, Cincinnati, Ohio, assigned to The Cincinnati Bickford Tool Co. *Patent 1,788,918.*

Metal-Coating Apparatus. Benjamin P. Finkbone, Middletown, Ohio, assigned to the American Rolling Mill Co. *Patent 1,789,172.*

Tools and Attachments

Apparatus for Making Dished Heads. Charles B. Cushwa, Youngstown, Ohio, assigned to The Commercial Shearing

& Stamping Company. *Patent 1,788,382.*

Chuck. George E. Garno and Eugene A. Garno and Eugene A. Engstrom, Worcester, Mass., assigned to The Heald Machine Co. *Patent 1,788,458.*

Means for Forming Star Drills. Martin Kappel, Beverly Place, Wilmington, Del., assigned to Sylvan N. Levy. *Patent 1,788,463.*

Lathe Center. Reuen Fisher, Detroit, Mich. *Patent 1,788,621.*

Grinding-Wheel Adapter. Archie D. Robinson, Westfield, Mass. *Patent 1,788,634.*

Clamping Device. William K. Andrew and Paul E. Butzin, Milwaukee, Wis., assigned to Kearney & Trecker Corporation. *Patent 1,788,652.*

Stud Setter. Charles R. Leiter, Rochester, N. Y., assigned to Consolidated Machine Tool Corporation of America. *Patent 1,788,679.*

Inside Caliper. John W. Parker, West Barrington, R. I., assigned to Brown & Sharpe Manufacturing Co. *Patent 1,789,020.*

Processes

Method of Cutting Curved-Tooth Gears. Harold E. Stonebraker, Rochester, N. Y. *Patent 1,788,639.*

Process of Making Rings. John Williams and Judson Williams, Philadelphia, Pa. *Patent 1,788,697.*

Method of Grinding Hobs. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works. *Patent 1,788,737.*

Process of Annealing Gray Iron. Roysel J. Cowan, Toledo, Ohio, assigned to The Surface Combustion Co., Inc. *Patent 1,789,136.*

Case-Hardening Method. Porter W. Shimer and Edward B. Shimer, Easton, Pa., assigned to American Cyanamid Co. *Patent 1,789,259.*

Furnaces

Temperature - Control Apparatus. Christian Wilhjelm, Philadelphia, Pa., assigned to Christian Wilhjelm. *Patent 1,788,787.*

Pair Furnace. William Isaacs and Elmer E. McVey, Youngstown, Ohio. *Patent 1,788,796.*

Conveyor for Annealing Furnaces. Evelyn Edwin Griffiths, Mumbles, Wales. *Patent 1,788,866.*

Metal-Sheet Furnace. William A. Blockinger, Pittsburgh, Pa., assigned to Homer Wolf, Steubenville, Ohio. *Patent 1,788,977.*

Case-Hardening Metal. Porter W. Shimer and Edward B. Shimer, Easton, Pa., assigned to American Cyanamid Co. *Patents 1,789,257 and 1,789,258.*

JANUARY 20, 1931

Metal-Working Machinery

Sheet-Metal-Radiator-Forming Machine. Louis Arthur Robitaille, Montreal, Quebec, Canada. *Patent 1,789,324.*

Machine for Centerless Grinding. Axel Gustaf Emanuel Hultgren, Soderfors, Sweden. *Patent 1,789,408.*

Portable Power-Driven Threading Tool. Herman W. Oster and Glenn D. Sleeth, Cleveland, Ohio. Assigned to The Oster Manufacturing Co. *Patents 1,789,411, and 1,789,412.*

Grinding Machine. Harry G. Miller, Denver, Colo., assigned to Miller Service Tool Co. *Patent 1,789,490.*

Board Drop Hammer. Morton C. Talcott, Hartford, Conn., assigned to The Billings & Spencer Co. *Patent 1,789,568.*

Machine for Fluxing and Coating Electrical Conductors. Lora E. Poole, Anderson, Ind., assigned to Delco-Remy Corporation. *Patent 1,789,709.*

Hydraulic Speed Changer. Amos P. Steiner and Harold E. Balsiger, Waynesboro, Pa., assigned to Landis Tool Co. *Patent 1,789,785.*

Machine for Making Insulated Wire. Beauford H. Reeves, New Haven, Conn., assigned to Rockbestos Products Corporation. *Patents 1,789,881 and 1,789,882.*

Feeding Mechanism for Machine Tools. Gustaf David Sundstrand, Rockford, Ill., assigned to Sundstrand Machine Tool Co. *Patent 1,789,886.*

Tools and Attachments

Chuck. Leon F. Meunier, Cleveland, Ohio, assigned to Chicago Pneumatic Tool Co. *Patent 1,789,559.*

Tool and Retaining Means Therefore. Edward W. Stevens, Detroit, Mich., assigned to Chicago Pneumatic Tool Co. *Patent 1,789,567.*

Rotary Hammer. Nelson P. Ridgway, Tacoma, Wash. *Patent 1,789,712.*

Saw. Jean B. Broillet, Brooklyn, N. Y., assigned to Irwin Rosenthal and Samuel Hirschborn. *Patent 1,789,804.*

Drill Holder. John V. Ostlund, Newcastle, Ind. *Patent 1,789,830.*

Processes

Method of Electrolytically Depositing Chromium. Oscar Hahn, Markranstadt, near Leipzig, Germany, assigned to Chrome-Plate, Incorporated. *Patent 1,789,523.*

Method and Apparatus for Treating Pipes, Bars, Etc. Kurt Theodore Potthoff, Lynbrook, L. I., N. Y., assigned to U. S. Galvanizing & Plating Equipment Corporation. *Patent 1,789,596.*

Die Extrusion Method and Apparatus. Albert Elias, Niemegk, by Bitterfeld, Germany, assigned to I. G. Farbenindustrie Aktiengesellshaft, Frankfort-on-the-Main, Germany. *Patent 1,789,675.*

Method and Means for Casting. Daniel H. Meloche, Bronxville, N. Y., assigned to American Radiator Co. *Patent 1,789,943.*

Furnaces

Metallurgical Furnace. William H. Smith, East Cleveland, Ohio. *Patent 1,789,847.*

Process and Apparatus for Treating Sheet Metal. William E. Watkins, New York, N. Y., assigned to Copper Plate Sheet & Tube Co. *Patent 1,789,853.*

TRADE PUBLICATIONS

BORING MACHINES, HORIZONTAL. The Universal Boring Machine Co., Hudson, Mass., now has available a circular giving complete descriptions of the Nos. 24 and 30 horizontal boring machines of the "Tri - Way" type. Specifications of both models are listed.

BUFFING WHEELS. The U. S. Department of Commerce, Bureau of Standards, has issued Simplified Practice Recommendation R115-30 entitled "Full Disk Buffing Wheels." The bulletin is sold by the Superintendent of Documents, Washington, D. C. for $0.05.

COLLETS AND CHUCKS. The Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass., has available bulletin No. 100-A on "Draw-In Collets and Chucks," giving complete descriptions, illustrations, and specifications.

ENAMELS FOR SHEET STEEL. The Engineering Experiment Station, University of Illinois, Urbana, Ill., has published Bulletin No. 214 entitled "The Effect of Furnace Gases on the Quality of Enamels for Sheet Steel." Copies may be obtained without charge.

PAINTING EQUIPMENT. The Vortex Manufacturing Co., 1978 W. 77th St., Cleveland, Ohio, has issued a descriptive circular of its policy of loaning paint equipment to manufacturers contemplating painting shop interiors.

PHOTOMETRIC SYMBOLS. The American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y., has issued the American Standard for "Symbols for Photometry and Illumination." The price is $0.20 per copy.

PYROMETER INSTALLATIONS. The Brown Instrument Co., Philadelphia, Pa., is distributing a large folder showing the application of pyrometers and automatic control instruments to 30 different makes of heat-treating furnaces.

TOOLS & MACHINERY. Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago, Ill., have issued a General Catalog No. 30 covering thousands of items used in the metal-working field, such as general equipment, machine shop equipment, sheet - metal or tin - shop equipment, and equipment for the structural, boiler or blacksmith shop and contractor. The book contains 158 pages and is of convenient size for reference.

NEWS OF THE WEEK

Society of Automotive Engineers Discusses Higher-Speed Cars

DETROIT, MICH., Jan. 23—Discussion of cars designed for higher road speeds with bodies and equipment affording minimum wind resistance, of air-cooled engines in comparison with water-cooled types, and of automotive Diesel engines, are among the high spots of the annual meeting of the Society of Automotive Engineers in progress here. At the body session it was freely predicted that future cars will have engines mounted at the rear, partly because of the better streamline form thus made possible and partly to afford more space for passengers in a car of given wheelbase.

Many points of advantage for air cooling were brought out in the paper by Franklin engineers. No special baffles are required to secure uniform cooling, and one sparkplug per cylinder gives as good results as more. In the discussion several engineers, especially those associated with General Motors, contended that the preponderance of advantage lies in water cooling, especially when greatest value per dollar is the objective, although the limitations of water cooling are recognized and a liquid permitting of higher cylinder temperatures is desired. Wider use of air-cooled engines was predicted by T. J. Litle, who spoke highly of Franklin car performance. The paper was unusual in that failures as well as ultimate success were described.

Sameness in general appearance of motorcars was criticized by H. Ledyard Towle, who stressed the need for greater originality in lines and wiser selection of color combinations. He urged car designers to go outside their own immediate profession for ideas and mentioned the desirability of canvassing dealer organizations to arrive at best selling color combinations. L. Clayton Hill predicted more convertible bodies with closer coupled seats and more rear luggage space.

Papers and discussion on automotive Diesel engines stressed their successful use, especially in Europe where over one thousand, comprising many makes, are now used in bus and truck applications. Even experienced drivers are often unable to distinguish any difference in performance between Diesel and conventional types. Some of the former have a speed range of 300 to 3,000 r.p.m. Standard Diesel fuel pumps and blowers for supercharging and scavenging are becoming available at moderate prices. American experiments with Diesel engines on buses, trucks, and aircraft were reported to be progressing satisfactorily, with worthwhile advantages

T. J. Litle

in fuel economy and reduced hazards from fire and monoxide poisoning.

Rapid growth in the use of smaller buses was reported in the transportation sessions. Future advantageous use of types seating as few as six or seven passengers was predicted. Larger buses capable of making 100,000 miles between major overhaulings are anticipated. But some companies now require as much as 25 per cent extra equipment for standby service. In large truck fleets, one speaker said the standby equipment can be reduced to 3 per cent. Standardization of frame widths, higher sustained speeds, great accessibility, greater comfort for operators, and easier operation were among the desirable features mentioned as needed, in future trucks. The absence of most of the leading truck and bus engineers from sessions in which users outlined their future requirements was regrettable. It was predicted that large operators may in the future co-operate with the engineers of bus manufacturing companies in preparing specifications for buses they require, and then have the vehicles built to order, perhaps on a cost plus basis, price being considered secondary to long life and to relative freedom from exclusive maintenance such as this plan is presumed to bring about.

Much interest was manifested in the plans for and model of the Armstrong seadrome submitted by the engineer responsible for the proposed development of these marine landing structures. Motion pictures of the scale model of the seadrome in a storm showed it to be much less affected by heavy seas than a shower of about the same dimensions. Construction details appear to have been worked out carefully, and estimates of cost are said to indicate that profitable operation of a chain of such stations across the Atlantic is possible.

Reports of research work by Prof. O. W. Boston and C. J. Oxford on the torque, thrust, and power required in drilling cast iron and steel indicate that machinability is not a function of hardness, that chemical composition is a factor of importance in controlling the ease of drilling, and that a heavy feed removes more metal per horsepower than a light feed. Much data useful to designers as well as to users of drilling machines was made available in this excellent paper.

Obsolescence and depreciation of machine tools both as to their effect on machinery costs and on overhead charged against the production department were discussed at length in a paper by Blackburn, Brussel, and Fors. Discussion from the floor included Heitkamp and Oesterlein who emphasized the advantages of co-operation between maker and user, consideration of reputation and reliability of maker, and method of accounting. Seven national meetings were held during 1930. Membership increased 276. Treasurer's and other reports were satisfactory.

Steel Founders Meet in Cleveland

The Steel Founders' Society of America, Inc., is holding its annual meeting and election at the Hollenden Hotel, Cleveland, today. J. E. McCauley, President of the Society, reported that 30 new members have been added since the society has reorganized, to bring the total to 78 members.

Vice-presidents each gave reports of the activities of their respective districts and commented on the better understanding among steel founders. The Merchandising Committee recommended that the words "cast steel" are to be used on all steel castings. The committee also recommended that each member of the association underwrite one page of its advertising and dedicate it to the industry in general rather than to the product of the specific company. The Industrial Research Committee reported the formulation and development of the Code of Standard Trade Customs for Steel Foundries.

Midwest Power Conference Scheduled for Feb. 9

FUEL and power experts are to assemble at the Stevens Hotel, Chicago, for the National Meeting of the A.S.M.E. Fuels Division and the Midwest Power Engineering Conference during the second week of February. These meetings have been held since 1925, but this year, the Fourth National Fuels Meeting will be held during the same week. This year's Fuels Meeting will be held from Feb. 11-13, and will follow a course somewhat different from that of each of the three previous meetings. The program this year will be devoted to specific problems. The Power Conference will open on Feb. 10 and continue through Feb. 12. The first Fuels Session will convene Wednesday afternoon, Feb. 11, and there will be several parallel sessions of Power Conference and Fuels Meeting.

Included in the papers to be presented at the Power Engineering Conference are "Power and Its Effect on the Methods and Progress of Modern Civilization," "Balancing Plant Investment with Operating Cost," "Advance in Electrical Distribution," "Dual Purpose Power Plants and Commercial Distribution of High-Pressure Steam," "Trends in Steam Turbine Development," "Reciprocating Engines for the Higher Steam Pressures," "The Influence of Use on the Design of Internal Combustion Engines," "Water Turbines of the Propeller Type," "High-Temperature Metals for the Power Plant," "Late Developments in the Electrical Field," "Arc Welding in the Power Plant," "High-Voltage D.C. Transmission." A joint banquet will be held in the main ballroom of the Stevens Hotel on Thursday, Feb. 12.

This year's engineering and power exposition will utilize 85,000 sq.ft. of space in the Chicago Coliseum. Because of the diverse types of equipment to be exhibited, the space has been divided into six general groups so that visitors may more easily find exhibits in any one group. The groupings include: Fuel-burning equipment, water-treatment equipment and hydraulic valves, steam-generating equipment, pipe and steam specialties, and heating and miscellaneous power equipment, including coal and ash handling, electrical apparatus, welding, and lubrication equipment.

Boat Industry Shows Its Products At 26th Motor Boat Show

SOME 230 exhibits, representing products of over 300 manufacturers, were included in the 26th annual National Motor Boat Show, held last week in the Grand Central Palace, New York City. Attractive, seaworthy cruisers were shown at costs equivalent to those of popular makes of automobiles. The trend toward the "family boat" was more noticeable than in several years past, and is indicative of the increasing interest of the public in boats and the consequent reduced price resulting from quantity manufacture. New models in runabouts and outboards were also shown in great variety, the price range in boats from dories to double-cabin cruisers being more complete than ever before.

Most of the boat and engine plants have had a good year—equal to 1928 in fact—and some companies had a better 1930 than 1929, partly because the market crash came after the close of the boating season and had become an old story before the next boating season opened. Boating has become an industry of first importance, with new companies entering the ranks from day to day. Even some of the automotive parts builders are now making boat hardware.

In sharp contrast with the increasing "flashiness" of automotive designs is the increasing practicability of boat finishing. Both makers and boatmen select boats and boat hardware on a basis of its ability to withstand the elements and still retain proper appearance. Stainless steel is being used with success for hardware, but the bronzes, Monel metal, and other old-line metals retain all their previous prestige. Among the interesting applications of stainless steel are nails and tacks.

Comparatively few new motor models were exhibited. There were more Diesels than previously, but other motors stressed refinements of detail and operation rather than striking change. Marine engines ranged in size from 25-hp. types to the 650-hp. Diesels, several light, high-speed inboard motors being shown.

Also evident at the show was the trend toward electrical units for lighting, radio, and even for galley service. Marine radios, incased in corrosion-resistant metals, are being developed, as well as several models of "salty" loudspeakers. Most of the radio sets follow the trend toward built-in units.

H. E. Fromm, in his paper at the S.A.E. Motorboat Meeting, under the title, "The Automobile-Type Engine for Marine Service," explained that motor-vehicle engines are entirely suitable for marine service provided rugged automobile, truck, or motorcoach engines are used as a basis. With careful design along marine principles, cylinder blocks, crankshafts, pistons, valves, tappets, and many other minor parts used in motor-vehicle engines can be used in marine engines without alteration, thus opening to the marine engine industry the production facilities, quantity purchasing ability, and financial resources of the automotive industry. R. H. Garrison, in his paper, "Marine Motors Vs. Automobile Motors for Marine Service," stresses the danger of permitting any garage to convert automobile motors for marine use. Mr. Garrison lists the many differences between the two types of service and the danger of conversion without adequate forethought and redesign. A. E. Luders, in his paper, "Milestones of the Motorboat," shows the growth of the industry and the reasons for that growth. He credits the automobile engine with the present trend toward fast runabouts and express cruisers, and gives most of the credit for the present "boat-mindedness" of the American public to their confidence in the reliability of the marine-engine builders' products.

Tool Distributors Answer Complaint

Machine tool distributors of the Chicago district have filed an answer to the complaint of the Federal Trade Commission, issued on Dec. 11, regarding the "Chicago Appraisal Plan" of making allowances for used equipment in the purchase of new machinery. According to both joint and individual answers, the plan does not restrict competition. The appraisal plan is detailed in the reply and distinct answers are made to each accusation of violation of the law. An outline of the plan, together with a copy of the circular sent out by the organization under date of Oct. 1, 1928, which describes the plan, are included as exhibits. The association also denies that its board of directors has any authority or power over its members and denies that it employs a clerk at its headquarters or that it has a headquarters. The answer states that "the central office is no more than an information bureau and recording agency, that it exerts no control whatsoever over the members or any of them, dictates no policies, makes no recommendations or suggestions, and has no power or authority than to receive and disseminate information within the limitations as herein above and hereinafter stated." The central office is described as "but a convenient name to describe the place where the records of appraisal of bids and their withdrawals are from time to time kept and maintained." Specifically the answer states that "This plan (the Chicago Appraisal Plan) in no way affects the individual members in the sale of their new ma-

chinery and there is no limitation, by agreement or otherwise, upon the members or any of them in regard to the kind of machinery to be sold, the territory of their operations, price maintenance, service and maintenance features, boycotting or black listing of customers or dealers, bonuses, refraining from competition, or other like practices." The respondent also denies "that any or all of the acts and things by it done have been or are to the injury or prejudice of the public and/or of the competitors of this respondent or of its members who make use of the 'Chicago Appraisal Plan,' and denies that any of its acts and doings constitutes unfair methods of competition in commerce.

"Wherefore, respondent, reserving all rights of appeal to any order of said commission, prays that the complaint herein against this respondent, its directors, and each of them, its executive committee, be dismissed."

The separate answers filed by individual members of the association are very similar in nature to the joint reply of the association.

Foundrymen Announce Program For Chicago Meeting

ADDITIONAL exhibit space, provision for several new sessions, a broader program of papers, excellent meeting room facilities, and all convention activities housed under one roof are promised for the 1931 convention of the American Foundrymen's Association, to be held May 4-7 in Chicago. Fifty per cent more exhibit space has been provided this year than was available at the 1929 Chicago meeting. Both the Exhibition Hall and the Grand Ballroom of the Stevens Hotel, where the convention will be held, are under contract for exhibition purposes. Space applications have been mailed out, and assignments of space will begin in the near future.

Another feature of the Chicago meeting will be the session on problems relating to pattern making. Increasing attention being given pattern production and procedure by foundrymen led to the initiation of this session. Another innovation will be the shop-operation course on sand control. This phase will consist of a three-period instructional course for those who seek information on how to install a sand control department. Another new shop operation course will be held also, dealing with malleable foundry practice. The five shop-operation courses will all be arranged to give instruction in the fundamentals of gray iron, steel, non-ferrous and malleable founding, and in sand control.

Round table luncheon meetings also have been scheduled for the malleable, steel, and non-ferrous groups. The steel castings conference will be presided over by H. P. Evans, Metallurgist of the Hubbard Steel Foundry Division of the Continental Roll & Steel Foundry Co. The chairman for the non-ferrous group will be H. F. Seifert, Superintendent of the brass foundry, Westinghouse Electric & Manufacturing Co.

Sessions of general interest which have been tentatively scheduled include those on foundry costs, pattern production, sand research, and apprentice training. Two cost sessions will be held, one on general foundry costs to discuss methods of figuring molding costs and data which the purchaser should furnish when requesting bids, the other devoted entirely to non-ferrous foundry costs.

A tentative schedule of meetings and events shows registration, the business meetings, and an opening of the exhibit of foundry equipment on the first morning. The first session of the sand control shop-operation course, gray iron founding, malleable founding, pattern production, and non-ferrous foundry costs will occupy the following morning. The malleable founding round-table luncheon, foundry costs, and shop-operation courses in steel, malleable, gray iron, and the first session of the non-ferrous course will occupy the afternoon. Wednesday's program begins with the second session of the sand control shop-operation course, gray iron founding, non-ferrous founding and steel founding sessions. The afternoon will begin with the steel founding and non-ferrous founding round-table luncheons, followed by meetings on sand research, apprentice training, and shop-operation courses on steel, malleable, gray iron, and the second session of the non-ferrous course. The annual A.F.A. banquet will be held that evening.

Thursday morning's meeting will begin with third session on the sand control shop-operation course, and sessions of gray iron, non-ferrous, and steel founding. The afternoon session will include the annual business meeting and a special lecture, with shop-operation courses in steel, malleable, gray iron, and non-ferrous founding.

PRODUCTION from the railway rolling stock industry in Canada reached a new high level in 1929, when the output was valued at $126,487,037. A report recently issued by the Dominion Bureau of Statistics shows that this compares with an output of $73,422,057 in 1928, and of $74,466,912 in 1927. Of the products turned out in 1929, 13,242 new cars valued at slightly less than $54,000,000 formed the largest single item.

Arc Welding in 1931

J. F. LINCOLN

President, the Lincoln Electric Company

EVERY year since the late war finds the use of arc welding gaining greater momentum in practically every industry. Regardless of the economic outlook for 1931, it is safe to say that this process will be applied more widely and more frequently than in any preceding year. There are several factors which determine the logic of this prophecy. Part of these factors lie within the development of the process and part are outside causes. . . . . The development of electrodes during the past year for the welding of various steel alloys will bring about a much wider application of arc welding and in turn permit a wider use of these alloy metals, particularly that of stainless steel and other corrosion-resisting metals. . . . . Like any new process, arc welding has met from time to time apparently insurmountable obstacles to its application. Refinements and developments of the process have always occurred to sweep such obstacles aside, thus opening new fields for the use of the process.

Economic pressure will force manufacturers to redesign their metal products, not only to improve their service, but also to lower the manufacturing cost. This condition offers an incentive to many manufacturers to discard their traditional designs in order to give their products the advantages of arc welded steel construction.

Regardless of general economic conditions during 1931, we will continue to advance and improve, and in this progress arc welding will play an increasingly important part. Just how far we progress depends in no small measure upon industry's intelligent use of electric arc welding.

THE Water Power branch of the Canadian Government reports that new water power installations brought into operation during 1930 aggregated 397,850 hp., bringing the total installation for the whole Dominion to a figure of 6,125,000. Construction is active, also, on a number of new undertakings of outstanding magnitude and with the completion of these during the next two or three years, more than 1,500,000 hp. will be added to the Dominion's total. 1930 work involved $80,000,000.

Gray Iron Institute Schedules Conferences

The Gray Iron Institute, Terminal Tower Bldg., Cleveland, has announced a series of conferences in the important industrial centers of the South and Southwestern territory. The purpose of these meetings is to inform gray iron foundry executives of the activities of the institute, the schedule being: St. Louis, Feb. 6, Statler Hotel; Kansas City, Feb. 10, Muehlebach Hotel; Oklahoma City, Feb. 13, Huckins Hotel; Dallas, Feb. 16, Adolphus Hotel; Houston, Feb. 18, Rice Hotel; New Orleans, Feb. 20, St. Charles Hotel; Birmingham, Feb. 27, Tutwiler Hotel; Atlanta, Mar. 2, Ansley Hotel; Chattanooga, Mar. 4, Read House; Louisville, Mar. 6, Brown Hotel.

Ryerson Takes Over Some Kempsmith Lines

As of Jan. 1, Joseph T. Ryerson & Son, Inc., Chicago, acquired the lines of "Maximillers," production millers, and automatic indexing machines formerly produced by the Kempsmith Manufacturing Co., Milwaukee. The transfer involves an outright purchase of good will, patents, patterns, inventory, and assets pertaining to these lines. Cone-drive milling machines produced by Kempsmith are not involved. Ryerson will act as general distributor, direct sales policies, and furnish an engineering staff, in line with Ryerson's recently adopted "General Distributor" plan.

THE erection of another ball-bearing factory in Moscow with the intention of tripling the present output during 1931 is under consideration by the Swedish Ball Bearing Co., which now operates a factory in that city, according to Edward Savage, Chargé d'Affaires, Stockholm, U. S. Dept. of Commerce.

PERSONALS

Oscar B. Bjorge, Manager of the Clyde Equipment Co., Portland, Ore., was elected president of the Associated Equipment Distributors for the coming year at the annual meeting on Jan. 13.

Burt B. Brewster, for 14 years intermountain manager of the Sullivan Machinery Co., Salt Lake City, Utah, has been appointed manager of the Illinois, Indiana, and Kentucky territories with headquarters at St. Louis and Mt. Vernon, Ill. O. S. Neslage, formerly manager at Mexico City, will succeed Mr. Brewster.

W. B. Champ was elected president of the Hamilton Bridge Co. at a recent meeting of the board of directors. Mr. Champ succeeds W. I. Hendrie, who has resigned. Mr. Champ was formerly vice-president and general manager.

C. H. Brunke has been appointed manager of the Toronto (Ont.) office of the United States Steel Products Co., 30 Church St., New York, to succeed F. C. Brunke, resigned.

G. H. Clamer, President of the Ajax Metal Co., Philadelphia, Pa., spoke on "The Romance of the Reclamation of Metals" over the Columbia Broadcasting System on Jan. 24. Mr. Clamer is one of the country's outstanding metallurgists, a past president of the A.S.T.M. and A.F.A., and a member of a number of other organizations.

Arthur H. Deute, Vice-President and General Manager of the Billings & Spencer Co., Hartford, Conn., has resigned, effective March 1, to join the Hamman-Lasan Co., Los Angeles, Cal., in an executive capacity, with principal activities concerned with the Matson Navigation Co., Los Angeles Steamship Co., and the Union Pacific Railroad.

Carl V. Dodge has been named manager of roll and steel casting sales of the United Engineering & Foundry Co., to succeed the late William Gardner. Mr. Dodge has been with the company for more than 25 years.

John F. Galvin, President of the Metal Stamping Co., Long Island City, New York, has been re-elected chairman of the Port of New York Authority. Mr. Galvin has been a commissioner of the Port Authority since 1923.

Joseph W. Hoffman was re-elected president of the Tiffin (Ohio) Manufacturing Co., at a meeting on Jan. 14. Herman Scheiber was chosen vice-president, Richard W. Scheiber secretary, and F. B. Scheiber treasurer.

Edward N. Hurley, Jr., President of the Electric Household Utilities Corporation, Chicago, has been re-elected president of the American Washing Machine Manufacturers' association.

Malcolm Carrington has been appointed assistant to the vice-president of the Westinghouse Electric & Manufacturing Co. He was formerly director of finished stocks. Mr. Carrington

joined the Westinghouse Company in 1904 and three years later was made assistant manager of the Railway and Lighting Department in the East Pittsburgh Works.

L. Kattenburg, President, Handelmy. R. S. Stokvis & Zonen, Rotterdam, Holland, arrived in New York on the *S. S. Bremen* on Jan. 20 for a visit of a week to ten days.

Lewis B. Lindemuth, Metallurgist and Consultant on steel mill operation, has been named vice-president and general manager of the Marine Steel Corporation, Chrysler Bldg., New York.

Ben R. Mayne, formerly general manager of the Saginaw (Mich.) Malleable Iron division of the General Motors Corporation, has been elected a vice-president of the American Malleable Co., a division of the American Brake Shoe & Foundry Co., New York. Mr. Mayne will have offices in Detroit and Owosso, Mich., with his time principally at the Malleable Iron Foundry at Owosso. He has been with the company since its organization 13 years ago.

G. S. McKee, formerly assistant factory manager of the Timken Roller Bearing Co., has resigned to accept the superintendency of the Majestic Household Utilities Corporation, 5801 Dickens Ave., Chicago, Ill.

Herbert A. May has been appointed assistant to the president of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., according to an announcement by F. A. Merrick, President. Mr. May will make his headquarters in the Grant Bldg., Pittsburgh. He is also a director of the Union Drawn Steel Co., the Mackintosh-Hemphill Co., the Pittsburgh Steel Foundry Corporation, and others.

H. W. McQuaid, Metallurgist of the Detroit-Timken Axle Co., Detroit, spoke on "Selection of Steels for Case Hardening, Their Treatments and Applications" at the January meeting of the Cincinnati Chapter, A.S.S.T.

Harry A. Rettig, associated for 12 years with the General Motors Corporation at Dayton, has been selected by Gov.-Elect George A. White of Ohio as purchasing agent for that state.

C. D. Roblin, of Consolidated Motors, Ltd., was the unanimous choice by the Winnipeg Motor Trades Association as its president for 1931.

R. K. Rothrock, 2204 Jefferson Ave., New Orleans, La., has been appointed district representative of the Chicago (Ill.) Pump Co. J. M. MacCrea will represent the company in the Syracuse (N. Y.) district.

Col. Howard C. Marmon, Vice-President in charge of engineering of the Marmon Motor Car Co., received the S.A.E. award for the year's most noteworthy automotive accomplishment in the development of passenger cars for his design of the 200-hp. all-aluminum engine in the new Marmon 16, presented to the public at the New York Show.

John Stevenson has been appointed general superintendent of the Brooks works of the American Locomotive Co., Dunkirk, N. Y., to succeed Charles A. Schrader, who resigned recently.

Russell St. John has been elected president of the Canadian Equipment Co., Montreal, Que., to succeed the late Burton Wyman St. John.

F. C. Thompson has been elected first vice-president of the Morse Chain Co., Ithaca, N. Y., a division of Borg-Warner Corporation, Chicago. D. B. Perry has been elected second vice-president and secretary. C. J. Kenerson is treasurer.

E. R. Walker has been appointed St. Louis district sales manager for the Newport Rolling Mill Co., and the Andrews Steel Co., both of Newport, Ky.

C. B. Murphy has been appointed manager of stationary Diesel engine sales for the Fairbanks, Morse & Co.,

900 South Wabash Ave., Chicago. Mr. Murphy's headquarters will be in Chicago. He has been with Fairbanks-Morse since 1913.

R. R. Wason has been elected president of Manning, Maxwell & Moore, Inc., New York City, to succeed C. A. Moore, who had been president since April, 1927. Mr. Moore retains his contact with the company as chairman of the board of directors. Mr. Wason was also elected president of the Consolidated Ashcroft Hancock Co., Inc., with plants in Bridgeport and Boston.

John L. Wolfrom is organizing the Wolfrom Canning Machinery Co., in Syracuse, N. Y., with offices in the Loew State Theater Bldg.

Samuel Wyres has been promoted to general plant superintendent of the Brainard Steel Corp., Warren, Ohio.

OBITUARIES

Pelle Anderson, Engineer in charge of the steam engine department, Allis-Chalmers Manufacturing Co., Milwaukee, died on Jan. 10. He had been associated with the company for 27 years.

T. Broom Belfield, 82, until 1908 identified with H. Belfield & Co., Philadelphia, died recently in that city. He was a director of the Franklin institute.

Rudolph R. Bauerle, 91, formerly with Bauerle & Morris Inc., Philadelphia, died on Jan. 9.

Horace W. Clark, 59, inventor and manufacturer of water meter boxes, died on Jan. 19 at Mattoon, Ill. He was responsible for some 50 inventions pertaining to water works equipment.

Richard W. Donigan, 76, President of the Todd-Donigan Iron Co., Louisville, Ky., until his retirement about a year ago, died recently at his home in that city.

Carl H. L. Flintermann, 54, President of the Wilcox-Rich Corporation, Detroit, a subsidiary of the Eaton Axle & Spring Co., Cleveland, died suddenly at Jackson, Mich., on Jan. 18.

Walter Platt Hatch, 78, who held many patents for inventions, notably in connection with typewriters, died in East Orange, N. J., on Jan. 19, He helped form the Elliott & Hatch Book Typewriter Co., which was later merged in the Underwood Elliott-Fisher Co.

Clifford Hubbell, 63, Vice-President of the Seneca Iron & Steel Co., Buffalo, died on Jan. 17 in that city after an illness of several months.

Hugh Johnston, 55, President of the Dominion Steel Equipment Ltd., Toronto, Ont., died recently in a hospital there.

W. R. R. LaVielle, 54, Chairman of the Neill-LaVielle Supply Co., Louisville, Ky., died on Jan. 4.

Thomas J. Nichol, head of the Nichol Plumbing & Steamfitting Manufacturing Co., Cincinnati, died on Jan. 18 in that city.

James Morpeth, 67, for many years general superintendent of the Brown & Sharpe Manufacturing Co., Providence, R. I., died on Jan. 15 at Tangerine, Fla., where he had been for some weeks because of ill health. Mr. Morpeth held the position of works superintendent until his retirement on Dec. 31, 1921.

Almon E. Norris, Chief Engineer of the Mead-Morrison Manufacturing Co., for 26 years and with the company and its subsidiaries for 35 years, died suddenly at his home in Brookline, Mass., on Jan. 15. During his career, he designed and invented many materials-handling units.

William Ottway Peck, Jr., a member of the sales force of the Herberts-Moore Machinery Co., San Francisco, died after a brief illness in that city on Jan. 12. Mr. Peck was formerly associated with the sales staff of the Westinghouse Electric & Manufacturing Co.

Roy J. Peterson, 45, Assistant Superintendent of the foundry, Farmall Works, International Harvester Co., Rock Island, Ill., died on Jan. 13 at the Moline City hospital.

George J. Potts, 40, President of the C. & G. Potts Co., Indianapolis, Ind., died on Jan. 9. He had been president for the past six years.

Orton L. Prime, 55, President of the Prime Manufacturing Co., Milwaukee, died on Jan. 14 of heart disease.

George A. Ward, 66, Designing Engineer of the Wilputte Coke Oven Corporation, New York City, died on Jan. 19 of complications following an operation.

FORTHCOMING MEETINGS

AMERICAN MANAGEMENT ASSOCIATION—Annual Personnel Conference, Niagara Falls, N. Y., Feb. 2-3. Headquarters, 20 Vesey St., New York, N. Y.

FIFTH MIDWESTERN POWER & ENGINEERING CONFERENCE AND EXPOSITION—Chicago, Feb. 10-14, 1931. G. E. Pfisterer, 53 West Jackson Blvd., Chicago, secretary.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7106 Euclid Ave., Cleveland, Ohio.

STEEL FOUNDER'S SOCIETY OF AMERICA—Sales clinic and regular meeting, March 19-20, Neil House, Columbus, Ohio. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

THREE-M-CONGRESS — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18. 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., N.Y.C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, 29 West 39th St., New York.

The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Aeronautic Meeting, Baltimore, Md., May 12-14, 1931.

National Applied Mechanics Meeting, Purdue University, Lafayette, Ind., June 15-16.

AMERICAN FOUNDRYMEN'S ASSOCIATION—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

NATIONAL FOREIGN TRADE COUNCIL—Annual Convention, May 27-29, at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual Meeting, Stevens Hotel, Chicago, June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary-treasurer.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

Tool dealers are feeling much better this week, with orders either holding even or increasing, and inquiries showing much more life and vigor. The New York, New Haven, & Hartford Railroad has issued a 13-tool inquiry for the Van Nest shops, including a 42-in. boring mill, a No. 2 cutter grinder, 3 engine lathes, 2 turret lathes, a combination punch and shear, a twin-head miller, 2 high-speed sensitive drills, a toolroom lathe, and a power bending brake. There are also a number of other good inquiries, principally for single tools. One dealer, answering the phone, was quite surprised to have the voice on the wire announce, "I'm sending you a lathe order!" Several others have been similarly surprised and cheered lately. Most dealers agree that the situation is now "looking up" even though it still may have a long way to look. January should be better than the two preceding months.

DETROIT

The slowly widening horizons of the automobile industry are causing a return of optimism to tool dealers. Automobile and accessory manufacturers are steadily increasing their purchases and while the advance has not been at all revolutionary, it is considered significant.

Orders and inquiries for tools, replacement machinery, and diversified equipment have been increasing in volume since the first or second week in January. In many cases the progress has been very noticeable, especially where the manufacturer had been out of the market entirely for a year or more. Machinery dealers believe 1931 will be substantially better than 1930, but still considerably below normal.

NEW ENGLAND

The long, hard pull lies just ahead. The climb is steep and treacherous as New England industry starts the grind. But already enough progress has been made to assure an improvement in January. Closing days of the month are displaying a better business tone, an increased volume of orders, and a good distribution of inquiries.

Executives feel that the automotive industry is bound to present a more far reaching buying program throughout 1931. The vanguard of inquiries already shows promise and the New England auto shows add luster to this promise. All have been well attended with heavier buying resulting than last year.

The current week registered a definite step-up in orders with demand favoring drills and lathes, items which have been practically dead in the interest of buyers for some time. Small tools are in better demand, with increased schedules reported from Western Massachusetts manufacturers.

CLEVELAND

A marked improvement has been noticed in the last ten days. Machinery dealers in several lines report an awakening of activity which seems to forecast better business for the next few months. Sales have shown increases and new business in the making shows greater promise. One concern reports that sales for the first half of January exceeded the orders booked in November and December.

The feature is the increase in new inquiries. Included is the list of seven 14-in. and ten, 16-in. lathes for the Dayton Airport, a lathe, shaper, drill press, and milling machine for the Bender Body Co. Cleveland, a list for the Toledo School Board, and lists for a Canton steel company and two Akron rubber manufacturers.

Industrial activity is gradually increasing with the return of men to employment and the increase of working hours.

■

IMPROVEMENT during the past week or ten days has justified the continuing optimism of dealers and manufacturers. Several lists, better inquiries, and increasing orders combine to increase the feeling of better times ahead. Prospects are beginning to act more civil when a tool purchase is proposed, in fact, are even suggesting a purchase themselves occasionally. Used tools are also going better.

NEW YORK, with a 13-tool New Haven inquiry, a number of others, and good sales, agrees that the situation is "looking up." Detroit reports increasing sales to automotive plants, many of which have been out of the market for a year or more. Other districts are also watching the automobile shows. New England noted more automotive inquiries, and also a step-up in drill, lathe, and small-tool orders. Cleveland has several fine-looking inquiries, including six lists, and better sales.

CINCINNATI manufacturers consider business "jogging along," though some claim it is much better. Selling agents there have noted an upturn. Philadelphia considers "jogging" too fast a word, and would substitute "crawling." Milwaukee contrasts sharply, having much better business than during the two previous months. Buffalo is much interested in vocational school business, which has also helped to pay the rent in a number of other districts lately. Chicago inquiries and orders are up, among them being a Santa Fé list, a South Milwaukee school list, and a better used tool market.

CINCINNATI

At least some of the machine tool manufacturers feel encouraged by happenings of the past week. A planer manufacturer has received several orders and his business is now better than it has been in the past five months. A lathe manufacturer has closed several sales, and these give him hope that the market is about to take on new life. Another manufacturer states that an increased number of inquiries are coming from automobile makers and expresses the opinion that this field is about to open up. The majority of the manufacturers, however, report that business is merely jogging along as it has been for some time, with neither loss nor gain in volume. Selling agents report that there is just a little upward trend in local and adjacent territory.

The week's sales were well scattered and well diversified, the requirements as a rule being single tools. A fair number of inquiries were received and in some cases immediate need was indicated.

PHILADELPHIA

Philadelphia machine tool dealers and manufacturers have not noticed improvement in the business situation such as has been reported from other localities and from other centers of activity. Business in this area has been virtually at a standstill for some weeks, except for an occasional replacement order of imperative necessity. The one encouraging sign in this market during the last two weeks was an improvement in the number and quality of inquiries.

MILWAUKEE

Compared with the last few months of the year just closed, business in the Milwaukee machinery and machine tool market in January is reported favorable and in many cases quite in excess of that period. However, in comparison with the same period a year ago, January failed to reach a volume that would be comparable and it is doubtful whether the next two months will show a favorable comparison with the same months of last year.

Orders being placed in Milwaukee continue to show a diversity of industries buying, while inquiries also are coming from a variety of sources. Manufacturers are reported to be showing a definite trend to equip their plants for more modern machinery in preparation for increased production schedules.

BUFFALO

There are some very definite signs of improvement in business among Buffalo machine tool dealers, though some of the dealers insist that conditions are no better than they have been for the last three or four months. However, some school equipment orders which have been hanging fire for several months were let on January 20. These were split fairly evenly among five dealers. Bids were asked on more equipment than was actually ordered, some of the projected purchases being temporarily abandoned through lack of funds.

During the last three or four months, several sales of equipment have been made to various schools throughout western New York, including Jamestown, Olean, Dunkirk, and Niagara Falls. Additional sales are pending at all of those points plus Medina and some others. These have helped considerably.

Dealers also note more of a demand for used equipment than has been the case for several years. Many of these inquiries are coming from small operators.

CHICAGO

Business in machine tools and general shop equipment is reported as evidencing an upward trend. Inquiries thus far in January have been considerably in excess of those received during any of the later months of 1930, and still are increasing in volume. Sales volume, also, is reported as expanding, a number of bookings for standard units of major importance being noted. These transactions, together with the increase in and nature of inquiries, are viewed as an augury of better times, and have generated an undoubted optimistic outlook. The Santa Fe, first of the railroads expected to mail lists for needed equipment, is inquiring for a number of tools, including shapers, lathes, grinders, a crank-pin turning machine, a radial drill, and a cylinder boring machine. The South Milwaukee Board of Education is in the market for 3 lathes, a hacksaw, an arbor press, a small pedestal grinder, and a bench drill, tools needed in the town's "tech" school. Improved conditions are reflected in the used tool market.

BUSINESS • BAROMETER

Most impressive feature of the situation is the upward movement in commodities

THEODORE H. PRICE
Editor, Commerce and Finance, New York

IT CANNOT be denied that last week furnished much evidence that trade and psychology are inseparable. This seems to be true of Great Britain and the Continent as well as of the United States and South America. In Latin America the situation has not entirely recovered from the recent revolutions, and a decline in silver which has carried that metal to the lowest point on record has not helped to untangle a Chino-Indian situation that is already complex.

But these and other developments that were not entirely re-assuring have caused but little tremor, and the Stock Exchange has got to a point at which it responds readily to bullish news and ignores what would normally be regarded as unfavorable. Hence a veteran of Wall Street describes the financial situation as "technically weak but practically strong." The same thing might be said of the commodity markets. They are slowly creeping up.

But the most impressive feature of the situation is the apparent concert in which the commodity markets are commencing to move, and the satisfaction felt by the many who are coming to believe that our farmers will soon be able to obtain higher prices for the fruit of their labor. This feeling is persistent, despite the announcement that 1326 United States banks failed during 1930, as against 642 in 1929. The commercial disregard of these failures is more impressive than most people appreciate.

Evidence that the optimism is being felt across the Atlantic is indicated by a press cable from London in which it is announced that the great London department store known as Harrods had placed a five-million-dollar order for new goods on Jan. 17. This order, which is believed to be a record for a single store, came at the end of a six-day clearance sale which constituted the greatest week of trading in the history of the establishment. Bits of news which indicate that a feeling of optimism is spreading on both sides of the Atlantic are now to be found in the daily papers, and the psychology of the situation is certainly more encouraging than it was.

In a recently published book, Professor Halford E. Luccock says that statistics indicate that one hundred years ago the average person had about 72 wants, of which 16 were regarded as necessities. Today the average of articles sought is 484, of which 94 are rated as necessities. "This," says Professor Luccock, "is the natural result of an age and country in which for the first time material comfort is within the reach of all. Comfort for millions of people and the standard of living have enormously improved." After reading it one is almost inclined to paraphrase Robert Louis Stevenson's whimsical statement that "The world is so full of a number of things that I am sure we should all watch out lest some of them cave in on us and smother us."

This quotation is very apt in its relation to the economic structure in which America, as well as the world in general, is now being taught to seek protection whenever a storm lowers. It is, nevertheless, gratifying to report that the clouds that were gathering now seem to be disappearing.

A highly comprehensive report upon unemployment indicates that it is largely confined to our greater cities, and even less of it is heard there. There are many indications that the decline in commodities has about run its course. Although the decline predicted has exceeded our expectations our faith in the value of the necessities of civilization is undisturbed. We believe that most merchants have made up their minds that the time to buy has arrived.

The industries which usually expand at this time are gaining a little ground, and the steel, automobile, and machinery manufacturers in particular seem confident that the bottom of the decline has been passed in their industries. Another seasonal gain is in wholesale buying for spring. These seasonal advances are not to be interpreted as a genuine upward trend in business, but replacement requirements will prevent any further decline in production and according to all precedents recovery of stock and commodity prices should coincide with an increase in trade.

The renewal of activity in the bond market is the most definitely encouraging development since the first of the year. It is once more possible for industry to raise capital through new security issues, and when the funds thus raised are added to the heavy expenditures already provided for in large part by governmental agencies, the effect is bound to be stimulative.

The habitual pessimists profess to be very fearful that we shall have an extra session of Congress to contend with during the coming summer. This is possible, but we doubt whether the effect will be depressing, as the appropriation of money is about all that Congress is likely to attempt and the balance of political power is so nicely adjusted that the expenditures authorized will be closely scrutinized at Washington as well as throughout the country.

THE BUSINESS WEEK

January 28, 1931

THE ability of business to hold the line is becoming impressive, and is far more significant than its failure to make any spectacular gains. . . . This resistance to further retreat has been evident in practically every indicator since the middle of December—in steel, coal, electric power production, in merchandise carloadings, and particularly in building contracts. . . . Commodity prices and stocks have likewise shown a persistently narrow range of fluctuation, and on the positive side, the bond market has made a fairly good recovery from its slump in the last quarter of 1930. . . . Our index of general business activity has held above the Hindenburg line of 75% of normal for six weeks, with a slight upward drift. . . . This week it still clings close to 80% of normal. All this is the more striking because it has come without any evidence of large-scale action by central banking authorities to check deflationary financial forces and hasten recovery, and in spite of a nasty political background. . . . Business is now obviously beginning to realize that it has to stand on its own feet and make the grade by its own initiative and energy, and is rallying its forces, with real leadership, to the defence of established standards of living upon which its future depends.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

SEVERAL important declines occurred during the last week in prices of shop materials. There were, however, no advances in any of the supplies listed here. Fabricated brass and copper dropped in all important markets. As an exception, brass and copper wire held firmly to quoted levels. Lead and drill rods are lower at New York warehouses; steel shapes, bars and bands, at Cleveland; and foundry coke at Connellsville. An erratic tin market has rendered unstable the prices of alloys containing this metal, with the result that quotations are merely nominal.

(*All prices as of Jan. 23, 1931*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
Ala. Foundry (Silicon, 1.75@2.25)	$14.19@$14.69
Tenn. Foundry (Silicon, 1.75@2.25)	14.19@ 14.69
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	20.41@ 20.91
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	14.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	18.26@ 19.26
Virginia No. 2 (Silicon, 1.75@2.25)	22.29
Basic	17.25@ 17.50
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.51
PITTSBURGH: (including freight charge, $1.76, from Valley)	
No. 2 Foundry	18.76
Basic	18.76
Bessemer	19.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.40†
No. 12	1.95	3.45†	3.10	3.45†
No. 14	2.05	3.55†	3.20	3.50†
No. 16	2.15	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2.35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.55
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.65
No. 16	2.40@2.50	3.85†	3.70	3.75
No. 18	2.55@2.65	4.00†	3.85	3.90
No. 20	2.70@2.80	4.15†	4.00	4.05
No. 22	2.75@2.85	4.20†	4.05	4.10
No. 24	2.90@3.00	4.35†	4.20	4.25
No. 26	3.15@3.25	4.60†	4.35	4.50
No. 28	3 40@3.50	4.85†	4.70	4.75

*Light Plates †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—Price per Foot— ½	⅝	¾	⅞	1	1⅛	1¼
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	2.95	3.00†
Soft steel bars	3.10†	2.95	3.00†
Soft steel bar shapes	3.10†	2.95	3.00†
Soft steel bands	3.40†	3.20	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	65%	55%	50%

*Flat, $\frac{3}{16}$-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.00@11.50
Tin, Straits, pigs, New York			29.00@30.00
Lead, pigs, E. St. Louis	4.55	New York	5.87½ @6.87½
Zinc, slabs, E. St. Louis	4.00@4.05	New York	5.50 @ 6.50

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.50	10.75
Copper sheets*	19.75	19.75	19.75
Copper wire*	12.75	12.87½	12.87½
Copper, drawn, round*	18.25	18.75	18.25
Copper tubing*	22.12½	22.12½	22.12½
Brass sheets, high*	17.12½	17.12½	17.12½
Brass tubing, high*	22.00	22.00	22.00
Brass rods, high*	15.37½	15.37½	15.37½
Brass wire, high*	17.62½	17.62½	17.62½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	21.50	21.50	18@20

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	45.00
Commercial genuine, intermediate grade	34.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.00	8.25	7.25@ 7.75
Copper, heavy, and wire	7.50	7.75	6.75@ 7.25
Copper, light, and bottoms	6.75	7.00	6.00@ 6.50
Heavy lead	3.50	4.00	3.00@ 3.50
Lead battery plates	1.50	2.00	2.00@ 2.50
Brass, heavy, yellow	4.50	4.75	4.00@ 4.50
Brass, heavy, red	7.25	8.00	6.25@ 6.75
Brass, light	3.50	4.00	3.50@ 4.00
No. 1 rod-brass turnings	4.75	5.00	4.25@ 4.75
Zinc	1.50	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.15	38.00 per M	.14½
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.096	.099	098
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.1537½	.1612½	.2125
Solder (½ and ½)	per lb.	.215	.215	.295
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%	65%	50–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.40@2.50
Coke, prompt foundry, per net ton	Connellsville,		3.25@4.85
White lead, dry	100 lb. kegs	New York,	13.25
White lead, in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from latest list, dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Wanted Equipment

O., Cleveland—Bender Body Co., T. Kundtz, V. Pres., 6409 Barberton Ave.—lathe, shaper, drill press and milling machine.

Ore., Portland—Beaver Wood Products Co., S. R. Smith, Pres. — woodworking machinery and tools for proposed 50 x 300 ft .factory. Estimated cost $50,000.

Pa., Point Marion—Lockard Whipp Lumber Co., V. D. Whipp—new machinery and equipment for lumber and planing mill destroyed by fire.

Tex., San Antonio — Bd. of Education, Matagorda and Water Sts.—tools and equipment for proposed 3 story, vocational school at 500 Main Ave. Estimated cost $150,000.

Wash., Seattle — Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich.—conveying equipment, etc., for proposed 1 and 2 story, 320 x 720 ft. automobile assembly plant.

Ont., London—Bd. of Education, W. R. Martin, Chn.—new machinery and equipment for proposed addition to technical school. Estimated cost $200,000.

Opportunities for Future Business

Ala., Montgomery — Constructing Quartermaster, will receive bids until Feb. 17 for the construction of air corps warehouse, machine and assembly shops, etc., at Maxwell Field.

Calif., Los Angeles—Los Angeles School Dist., is having plans prepared for Alexander Hamilton high school including 78x155 ft. shop building, etc., on Robertson Blvd. Estimated cost $400,000. F. M. Ashley and J. C. Austin, Chamber of Commerce Bldg., Archts. Noted Jan. 1.

Calif., Richmond—Atchison, Topeka & Santa Fe Ry. Co., 6th and Main Sts., Los Angeles, is receiving bids for the construction of a 1 story shop here. M. C. Blanchard, Los Angeles, Ch. Engr. Noted Jan. 22.

Calif., San Francisco—G. W. Price Pump & Engine Co., 1350 Folsom St., will build a 1 story shop at 10th and Folsom Sts. Estimated cost $11,000. Work will be done by day labor.

Calif., San Mateo—Pacific Gas & Electric Co., 245 Market St., San Francisco, awarded contract for the construction of a group of shop buildings here. Estimated cost $60,000.

Calif., Stockton — Schmidt Lithograph Co., Second and Bryant Sts., San Francisco, acquired a site and plans the construction of a plant for the manufacture of paper products in Boggs Tract here. Estimated cost to exceed $150,000.

Conn., Waterbury—Kaplan Bros., 352 East Main St., is having revised plans prepared for the construction of a 1 story, 50 x 110 ft. garage, service station, etc., on East Main St. Estimated cost $40,000. T. M. Freney, 69 Center St., Archt. Noted Jan. 8.

Ind., Evansville—National Battery Co., is having plans prepared for a service station at 501 N. W. 4th St. Estimated cost $45,000. A. E. Neucks, 606 Old State Bank Bldg., Archt.

Ind., Evansville—Standard Oil Co., 137 West 11th St., had plans prepared for the construction of a service station. Estimated cost $41,500. Private plans.

Ind., Fort Wayne—Fox Realty Co., Harrison and Washington Sts., awarded contract for a 3 story, 120x150 ft. garage. Estimated cost $200,000.

Ind., Richmond—Thompson Bros., awarded contract for a 40x90 ft. service station on South 5th St. Estimated cost $40,000.

In., Earlham—Hawkeye Portland Cement Co., Hubbell Bldg., Des Moines, plans the construction of a 2 story, 36 x 106 ft. machine shop and office, etc., here. Private plans.

Me., Oakland—Getchell Foundry & Machine Works, C. W. Getchell, plans to rebuild 1 and 2 story foundry and wood turning mill destroyed by fire. Estimated cost $40,000. Private plans.

Mass., Waltham—Bell Bros., 110 High St., will build a 1 story garage and storehouse on Lexington St. Estimated cost $40,000. Private plans. Work will be done by separate contracts.

Minn., Minneapolis—Firestone Tire & Rubber Co., 1278 South Main St., Akron, O., plans the construction of a 2 story repair shop and service station at 11th St. and Harmon Pl. here. Estimated cost $50,000. Private plans.

Minn., St. Paul—Railway Express Agency, Inc., F. A. Cole, Supt. of Bldgs., 815 Well St., Chicago, Ill., plans the construction of a 1 story, 80 x 125 ft. garage at Grove St. and Broadway here. Estimated cost $40,000.

Mo., St. Louis — Chandeysson Electric Co., 4092 Bingham Ave., will build a 1 story, 82 x 200 ft. addition to electric manufacturing plant. Estimated cost $40,000. Clymonts & Heinicke, 721 Wainwright Bldg., Archts. Work will be done by separate contracts.

Mo., St. Louis—Pickwick-Greyhound Lines, Inc., S. O'Neil Dist. Mgr., Union Market Bus Terminal, is having preliminary plans prepared for a bus terminal and hotel. Estimated cost $1,500,000.

Neb., Lincoln—International Harvester Co., 606 Michigan Blvd., Chicago, Ill., awarded contract for a 1 story, 110 x 450 ft. warehouse and service building. Estimated cost $65,000.

N. J., Ridgefield—Lowe Paper Co., River Rd., will build a 2 story lithograph shop. Estimated cost $50,000. F. L. Smith, 21 East 40th St., New York, N. Y., Archt. and Engr. Work will be done by day labor and separate contracts. Noted Jan. 8.

N. Y., Attica—Dept. of Correction, Capitol, Albany, will receive bids until Feb. 26 (extended late) for the construction of a group of buildings including administration building, state shop building, shop building, textile shop building, maintenance storehouse, etc., at State Prison here. Noted Dec. 25.

N. Y., Brooklyn—Nanman Building Corp., B. Zisku, Pres., 10360 104th St., Richmond Hill, is having sketches made for the construction of a 100 x 161 ft. service garage, gas station, etc. at 86th St. and Ave. W. Estimated cost $40,000. W. A. Lacerenza, 26 Court St., Archt.

N. Y., Brooklyn—A. Smith, Stillwell Ave. and Quentin Rd., will receive bids in late fall for a 2 story, 80 x 100 ft. service garage. Estimated cost $50,000. Burke & Olsen, 32 Court St., Archts. Noted Jan. 1.

N. Y., Elmhurst—Cord Meyer Co., Broadway, will receive bids about Apr. 1 for the construction of a 100 x 200 ft. service garage at Roosevelt Ave. between 88th and 89th Sts. Estimated cost $85,000. R. Tappan, 1134 Atom Pl., Forest Hills, Archt. Noted Jan. 15.

N. Y., Flushing—W. A. Walsh & Co., Bank of Manhattan Bldg., Bridge Plaza, Long Island City, is having sketches made for a 100x210 ft. service garage, etc., at Dahlia Ave. and Main St. Estimated cost $70,000. A. Eccles, Hunter Ave., Long Island City, Archt.

N. Y., Jamaica—Hickory Homes Corp., c/o H. Dean, 104-23 220th St., Queens Village, Archt., will build a 1 story, 100 x 100 ft. service garage at 98th Ave. and 218th St. Estimated cost $40,000. Work will be done by day labor and separate contracts. Maturity after Mar. 1. Noted Jan. 1.

N. Y., Long Island City—F. C. David, 319 East 54th St., will award contract about May 1 for the construction of a mortuary and garage at 60 Second Ave. L. H. Bailey, 3113 Grand Ave., Astoria, Archt.

N. Y., Long Island City—M. G. C. Realty Co., c/o J. S. Kennedy, 157 Remsen St., Brooklyn, postponed construction of a service garage at 101st Ave. and 121st St. $40,000. Project abandoned. Noted June 26.

N. Y., Long Island City — Queens County Motor Co., 103 Arleigh Rd., service garage at Barrett St. and Queens Blvd. $250,000. H. C. Brucker, 2424 Myrtle Ave., Archt. Project abandoned. Noted May 1.

N. Y., Naponach—Dept. of Correction, State Capitol, Albany, will receive bids until Feb. 19 (extended date) for the construction of a shop and storage building at State Institution for Defective Delinquents here. Noted Dec. 25.

N. Y., New York — Allerad Realty Co., 391 East 149th St., will build an 80 x 100 ft. service garage at Tremont and Leland Aves. Estimated cost $40,000. Siegel & Levy, 1775 Broadway, Archts. Work will be done by separate contracts. Noted Jan. 1.

N. Y., New York—Berk-Lafayette Realty Co., L. Berkowitz, Pres., 320 Broadway, plans the construction of a 2 story, 80x145 ft. service garage and gas station at 403 Lafayette St. Estimated cost $75,000. D. S. Lang, 1860 Broadway, Archt.

N. Y., New York—Spear & Co., 225 5th Ave., will soon award contract for the construction of a garage and workshop at 524 West 23rd St. Estimated cost $450,000. L. Davidson, Archt.

N. Y., Richmond Hill—Guthy Holding Corp., 18 East 48th St., New York, is having sketches made for the construction of a 4 story, 89x103 ft. service garage at Myrtle Ave. and East 116th St. here. Estimated cost $125,000. Murchison & Gompert, 101 Park Ave., New York, Archts.

N. D., Mandan—Northern Pacific Railway Co., Railroad Bldg., St. Paul, Minn., plans the construction of a shop building in connection with proposed new freight yard here. B. Blum, St. Paul, Ch. Engr.

O., Canton—Bosshardt Steel Corp., Allen Ave. S. E., manufacturers of steel castings, awarded contract for reconstruction of plant recently acquired from Canton Sheet Steel Co. to include several plant units, two new Bosshardt furnaces, etc. Estimated cost $100,000.

O., Elyria—Elyria Foundry Co., W. F. Gollmar, Mgr., is having plans prepared for the construction of a 1 story, 113x365 ft. foundry on Felbert St. Estimated cost $100,000. E. G. Hoefler, 5005 Euclid Ave., Cleveland, Archt. and Engr.

O., Middletown — Raymond Paper Co., will soon award contract for the construction of a 1 story paper bag factory. Estimated cost $150,000. Lockwood, Greene & Co., Hanna Bldg., Cleveland, Archts. Noted Oct. 30.

Pa., Corry—Corry-Jamestown Mfg. Co., Center St., manufacturers of steel cabinets, plans the construction of a warehouse in Erie County. Private plans.

Pa., Erie—Erie Resistor Corp., H. C. Sherk, Mgr., 644 West 12th St., manufacturers of radio parts, plans the construction of a factory on West 12th St. Private plans.

Pa., Erie—Heisler Locomotive Works, G. L. Swabb, Mgr., 316 West 16th St., plans the construction of a plant. Private plans.

Pa., McKeesport—Bd. of Education, c/o J. B. Ritchey, Supt. of Schools, Ariel Bldg., is having preliminary plans prepared for the construction of an industrial school, including shop and laboratory facilities, etc. Estimated cost $600,000. C. R. Moffitt, 304 Masonic Temple, Archt.

Pa., New Brighton—William Leard Co., 4th St. (machinists), awarded contract for a 1 story, 40 x 100 ft. addition to factory. Estimated cost $40,000. Noted Dec. 4.

Pa., Sharpsville — Sharpsville Boiler Works, has work under way on addition to plant for the manufacture of meter pumps and service station equipment.

R. I., Pawtucket—Frank Cook, Inc., 103 Exchange St., is having sketches made for the construction of a 1 story, sales and service garage on North Main St. Estimated cost $50,000. A. Addeo, 117 Broadway, Providence, Archt.

Tex., Fort Worth — Texas Rail Joint Co., Joliet, Mo., awarded contract for the construction of a steel fabricating plant, including machine shop and forging plant at Commerce St. N. E. and 4th St. here. Estimated cost $150,000.

Tex., San Angelo—City defeated election for $75,000 bonds for the construction of an airport to include two hangars, mechanical shop, etc. E. E. Laurie, City Mgr.

Wash., Seattle — A. Kahn, Inc., 1000 Marquette Bldg., Detroit, Mich., is receiving revised bids for a 1 and 2 story, 320 x 750 ft. automobile assembly plant, including assembly building, oil house, dock 40 ft. wide and 500 ft. long on East Marginal Way for Ford Motor Co., 3674 Schaefer Rd., Dearborn. Estimated cost $1,500,000.

Wash., Seattle—A. R. Turner Co., 2325 Iowa Ave., plans the construction of a 1 story, 80 x 200 ft. plant for the manufacture of roofing paper, mineraled surfacing roofing and building and tarred felt. Estimated cost $65,000.

Wis., La Crosse—Derr & Rasmusson, E. H. Derr, Contrs., Second and La Crosse Sts., has work under way on a 2 story, 88 x 89 ft. repair and service garage at 7th Ave. N. and 3rd St. Estimated cost $35,000.